The Political Economy of the Regulatory Process: An Empirical Approach

D I S S E R T A T I O N

zur Erlangung des akademischen Grades
doctor rerum politicarum
(dr. rer. pol.)
im Fach Volkswirtschaftslehre

eingereicht an der
Wirtschaftswissenschaftlichen Fakultät
Humboldt-Universität zu Berlin

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eingereicht am: 14. Juni 2002
Tag der mündlichen Prüfung: 17. Juli 2002

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Acknowledgments

I would like to thank the many people who I encountered during these years and who helped me in developing this project through their suggestions, discussions, teaching, and support. First, I want to express my gratitude to my advisor Lars-Hendrik Röller. He taught me to appreciate the charm of empirical industrial organization and stimulated my interest for political economy topics. Throughout my period as a doctoral student he inspired me with his advice and provided me with many opportunities for getting in touch with the fascinating world of research. Also, I want to thank Kai A. Konrad, who acted as my second advisor, and gave me various stimulating comments.

I had the luck of meeting many colleagues from different institutions over the last five years. I am particularly in debt to Elmar Wolfstetter, who made it possible for me to begin my doctoral studies in Berlin as a member of the "Graduiertenkolleg Angewandte Mikroökonomik." Besides, I am very thankful that he kindly offered me the possibility to work at his *Institute of Economic Theory I* at the Humboldt University Berlin during the first years as a Ph.D. student. There, I found not only a stimulating research environment but also a open and nice atmosphere and good friends. I thank Uwe Dulleck, Veronika Grimm, Jörg Oechssler, Dorothea Kübler, and Frank Riedel for those exciting years. I also express my gratitude to Regine Hallmann and Sandra Uzman for their kindness and assistance. At the Graduiertenkolleg I also met many interesting fellows, who helped me take the first steps into the world of research. Particularly, I want to thank the so called "AG:" Ida Bagel, Hans Friederiszick, Silke Neubarer, Hans Mevis, Michael Tröge. Together with them I discussed my first projects and learned many new things, but also saw that doing research can mean having fun together.

In 1998 I moved to the WZB. Here I found another extremely stimulating and international research environment. The *Competitiveness and Industrial Change* Unit, directed by Hendrik Röller, is a dynamic, young and really exciting place to be. I want to thank my colleagues here not only for helping me to intellectually grow with interesting and inspiring discussions, but also for their friendship and for the many nice and relaxed moments we spent together

in the kitchen! Many thanks to Thomas Cusack, Bianca Faber, Manfred Fleischer, Michael Grajek, Paul Heidhues, Jos Jansen, Astrid Jung, Johan Lagerlöf, Talat Mahmood, Rainer Nitsche, Ralph Siebert, Andreas Stephan, Christian Wey, Christopher Xitco, Zhang Zhentang, and Christine Zulehner. Particular thanks are due to Christopher Xitco and Matthias Oppermann who, with stoical patience, read the different versions of this manuscript and corrected my bad English, as well as to Rainer Nitsche who helped me with his encouragement especially in the last and most difficult period of this adventure. Also, I am very grateful to Astrid Jung: I enjoyed working with her not only because I learned so much through our joint project and her rigorous thinking, but more so because of her openness through which we have become good friends. My research also greatly benefited from discussions with seminar participants at the WZB, Humboldt University, University of Padua, *Ca' Foscari* University at Venice, University of Bologna, University of Vienna, and with participants of the EARIE Conferences 1999 and 2000, EEA Conference 2000, various CEPR conferences, and the Young Economists Conferences 1999, and 2000.

Miriam Stachat is the person who merits my best thank. During these years she was on my side and supported me with her love, patience, and comprehension. Without her, I surely would not have come to this point.

Last but not least, I have an enormous debt towards my parents. They supported my every decision trusting me and sustaining me "in spirit and matter." They were always present: in the good times by sharing my joy and in bad moments with their encouraging words, therefore this work is dedicated to them.

Chapter 1

General Introduction

> *Economists cannot claim that market failure can be corrected simply by showing that the optimal outcome in a model of social-welfare maximizing entity divorced from any real political process will outperform the market.* Avinash Dixit, "The Making of Economic Policy: A Transaction-Cost Politics Perspective," 1996, p. XV.

1.1 Introduction

This thesis analyzes the interactions between economic and political forces in shaping the regulatory process. By means of various empirical models and different data bases, I develop an approach that bridges between the political economy and the industrial economic traditions, with the purpose of providing new empirical tools and ideas for analysing the political economy of regulation, as well as robust results that stimulate a renewed debate on this topic. On the one hand, I use the data and empirical analysis with the purpose of testing predictions stemming from the existing theory. On the other hand, by pointing out the existence of robust empirical relationships, my findings open new questions, which still deserve a convincing answer from a theoretical point of view.

The purpose of my approach is to fill the evident gap in the empirical literature on the positive theory of regulation. Even though a few studies exist,

which empirically analyze the determinants of different regulatory policies, almost no attempt has been made to develop more complex and complete econometric models that are able to explain and analyze the regulatory process as a whole. In particular, to the best of my knowledge, there is almost no empirical study that endogenizes both the firms' and policy maker's (regulator or government) behaviors.[1] This endogenization is a prerequisite in order to explicitly consider the interactions among the product market and the political arena where regulatory decisions are made, which is one of the contributions of this thesis. In different methodological steps, I consequently develop various empirical approaches, which allow me to shed light on the complex processes staying behind regulatory policy. Applying these models to the data, I provide strong empirical support to the thesis that the interactions between markets and politics play a central role in determining economic policy.

Methodologically, this thesis makes use of different econometric approaches. In the first part, which is more in line with the political economy tradition, I estimate one-equation reduced-form models for policy making. The aim is to analyze the process that leads to entry deregulation on a cross-section of countries in order to generate some robust stylized facts. This can then be useful for a better understanding of the institutional factors that drive regulatory intervention and, at the same time, can work as a guide to deeper theoretical research. In the second part of the thesis, I mainly concentrate on firms' behavior in a regulated industry, thus staying closer to the industrial economic tradition. Although the theoretical work in this field has not yet derived complete models of firms' strategic behavior in the product market, lobbying, and regulation, from which a structural approach can be derived, I develop and estimate empirical models built as systems of simultaneous equations, which are partially theoretically based. The advantage of this methodology is its flexibility, which allows to explicitly focus on particular aspects of the interactions among firms and between firms and policy makers.

In this thesis, I develop two new databases by merging information from various sources. The first database focuses on the deregulation of the mobile

[1] The only exceptions are Cadot, Röller and Stephan (2000) and Stephan (2002).

telecommunications industry in OECD countries during the 1990's. Specific data on regulatory policy and institutions and on market structure stemming from different OECD data banks are merged with information about the member states' political and institutional environments. The political side of the data is particularly rich and covers institutional details (such as the electoral system, the regime type, and other measures of a country's degree of consensus), the governments' and legislatures' compositions, and their political orientation as expressed by the parties' programmatic positions. Especially the latter data, which are elaborated from a newly published database built up from political scientists taking part in the *European Consortium for Political Research*, constitute a unique source of information since they are based on the direct analysis of the political parties' programs and not on estimates or proxies generated by the econometrician.

The second database is over the U.S. mobile telecommunications industry during the second half of the 1980's. A unique set of information on market characteristics form its basis and has been kindly made available by Phil Parker and Lars-Hendrik Röller. In the second essay, I enhance it with information stemming form the *Book of the States* and the *U.S. Statistical Abstract,* which deals with the states' regulatory policy and political and regulatory environments. In the third essay, together with Astrid Jung, we rearrange the data used for the previous work and add additional political variables, as well as information about firms' lobbying expenditures as expressed by their campaign contributions, which were provided by the *Center of Responsive Politics*. The development of these databases is one of the contributions of my work that has been already exploited in this thesis, yet it will be the basis for future research on the political economy of regulation.

The purpose of this introduction is to present a unifying framework that encompasses the processes that shape economic policy determination in general (and not only regulation), in which I will position my studies and related literature. I will point out which relationships and actors seem to be crucial in order to understand such processes. Doing this, I shall first give a frame of reference that bridges the many different approaches stemming from the political economy as well as industrial economic traditions. Second, I relate the

literature on the politics of regulation to the more advanced literature developed in other fields of economic research. Finally, I explain my contributions with respect to the existing theoretical and empirical studies.

1.2 A Unifying Framework

Figure 1.1 provides a graphical representation of the processes leading to economic policy's determination. In this section, I will highlight the main relationships among the actors represented in the figure and, in the next sections, I will discuss at length the literature related to my study and the open questions answered by my work.

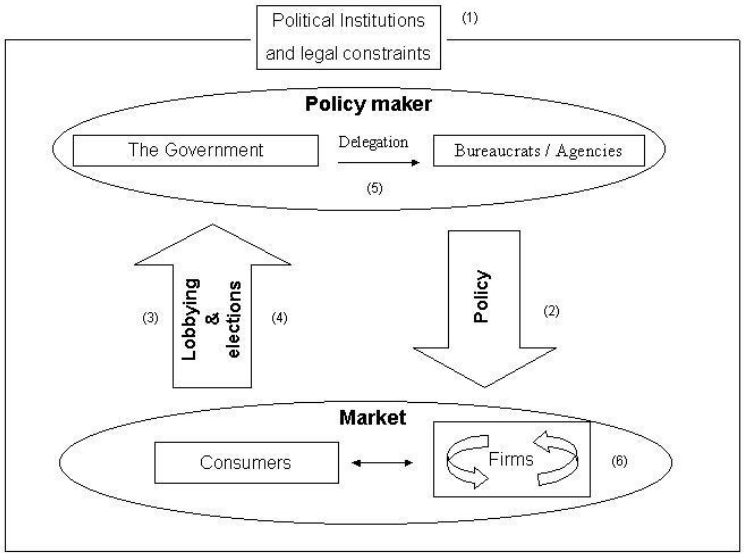

Figure 1.1: The Framework of Economic Policy Determination

As a starting point, I assume that the states' "political, institutional, and legal constraints" are exogenous factors, i.e. they do not respond to policy changes. The electoral rule or the regime type, for example, are only very seldom subject to revisions in contrast to the economic policies which are determined in the short or medium run. Political institutions, which can be

considered as the "rules of the game" or the framework (1) for the policy making process, are important because they determine how political representation is chosen and also because they shape agents' incentive to participate in the political process. The notion that the political constitution may influence policy decisions, an idea that has been most notably developed in the political science literature under the label "comparative politics," has only recently attracted the interest of economists. This approach consists of building policy formation models - generally adopting the electoral competition framework - under different assumptions about the institutions in place. Different equilibrium outcomes can then be derived, which hinge on different institutional details, and can be compared in order to determine how such features influence policy decisions (Pommerehne, 1990; Austen-Smith, 2000; Persson and Tabellini, 1999; 2001, Persson, Roland, and Tabellini, 2000; Lizzeri and Persico, 2001; Milesi-Ferretti et al., 2001; and Besley, 2000).[2]

Four main actors, which can be divided in two subgroups that interact with each other, operate within the framework: the policy maker and the market. The government and the bureaucrats belong to the policy maker, while consumers and firms are the agents operating in the market. One of the central ideas of this thesis is the need to explicitly consider the interactions among these subjects in order to correctly understand the causes and effects of policy.

The government, which is selected through the electoral process, chooses the policy that influences the firms' behavior constituting the first channels through which the market and policy maker are interrelated (relation (2)). The bureaucrats are agents to whom the government might delegate (relation (5)) the power to make some of the policy decisions. The consumers take part in the political process through their voting behavior (relation (4))- and, less intensively, through their lobbying activities - and to the market game through

[2]Persson and Tabellini (1999) and (2001) and Milesi-Ferretti et al. (2001) have also empirically tested the predictions derived from their theoretical models. They showed that the regime type (presidential vs. parliamentary) and the electoral system (majoritarian vs. proportional) strongly influence fiscal policy and, in particular, the size of government and the composition of public spending.

their consumption choices. Finally, the firms strategically interact with each other as well as with consumers in the product market (relation (6)), while they participate in the political process through their lobbying activities (relation (3)). The elections and the lobbying process constitute the second channel through which the market and policy maker are linked.

In modern representative democracies the government is elected according to the rules given by the constitution.[3] The first important mechanism for policy determination, which establishes *who* must decide on policy, is the electoral game (Downs, 1957). In the modern political economy literature, the electoral competition framework has become the milestone upon which most models are built in order to guarantee a solid microeconomic foundation (see Persson and Tabellini, 2000 for a very clear presentation).

The second important element in the policy making process is *how* decisions are made. The politicians/governments have two options: they either make the policy themselves, or delegate this policy decision to third parties, namely bureaucrats or agencies. The delegation process designs the bureaucratic institutions, whose characteristics - such as transparency, accountability and independence - affect the bureaucrats' policy choices by shaping their incentives and instruments (Baron, 1988; Laffont and Tirole, 1991 and 1993; Laffont, 1996; Persson et al., 1997; Estache and Martimort, 1998; Laffont and Martimort, 1999; Faure-Grimaud and Martimort, 2000; Besley and Coate, 2000). In this research, I will assume that these institutions are exogenous and concentrate on how their design may influence the policy making process.

Independently of whether the policy is directly made by the government or delegated to bureaucrats, the policy makers interact with other actors: the voters and the private interest groups or lobbies. The policy decision is the result of an optimization problem. Politicians or bureaucrats, who in the modern political economy tradition also are self interested agents, maximize

[3]One strong simplification that I make in the work that follows is to consider the "government" as a unique body, neglecting the existence of different levels in the decision making process: the legislative, executive, and jurisdictional powers. See Levy and Spiller (1996) for an interesting case-study analysis of institutions' role in shaping the regulatory environment and policies.

a function where different arguments play a role. On the one hand, they care about being in power, and therefore choose policies in order to achieve consensus in their constituency, which would bolster their re-election prospects (Alesina and Rosenthal, 1995; Besley and Coate, 1997; and more in general Persson and Tabellini, 2000). Thus, electoral competition considerations shape their objective function and thus the chosen policy. On the other hand, interest groups influence the policy maker through the lobbying process, i.e. through campaign contributions, information transmission, corruption, and bribery. Therefore, selfish politicians value in their utility function the private benefits that they would get if they implemented the policies that are preferred by the interest groups (Grossman and Helpman, 1994 and 1996; Helpman and Persson, 2001; and Besleyand Coate, 2001).[4]

The interactions among these agents lead to the policy choice, which influences the market outcome. This thesis analyzes this process by means of empirical analyses. The main point that I make in this work is the need to explicitly consider the simultaneity between policy decision and market outcome. The idea behind this consideration is that, because policy strongly influences the market outcome, the actors who play the market game are those actors who mostly have an interest to influence the policies that determine the environment where they operate.[5] Policy endogeneity and the simultaneity between politics and market are important issues to account for, since neglecting them may lead to inconsistent and biased estimates of both the determinants and the effects of economic policy. I provide strong empirical evidence to support this view.

In the following section, I will deal more in depth with the literature related to my thesis. I will order this literature according to the relationships presented

[4]See also Persson and Tabellini (2000) and Grossman and Helpman (2001) for a general treatment of these approaches.

[5]Baron (2001) points out the importance of considering firms' "non market" strategies" beside their market strategies, in order to fully understand their behavior. Non market strategies - i.e. all those which are not directly chosen in the market game - are in fact used by firms in order to improve their performance. Also see Baron (1999) for a more specific model of firms' lobbying activities and De Figuero and Tiller (2001) for an empirical analysis.

in Figure 1.1 and contrast the existing results with my findings.

1.3 Related Literature

Over the last decades, the literature on industrial organization has thoroughly dealt with a normative analysis of regulation both from the theoretical as well as from the empirical point of view. The analysis has focused on how regulation might influence the market outcome, the market structure, and, in general, firms' behavior in the market place.

Generally speaking, this strand of the literature considers the policy decision as exogenous and assumes that regulation exists in order to alleviate the negative effects of market failures. Following the "welfare economics" tradition, is postulated the existence of a benevolent government (or regulator) that maximizes a "total welfare function" and must decide upon the optimal regulatory instruments in a world where imperfect information among agents constrains the available choices' set to the public authority (see Baron and Myerson, 1982 and Laffont and Tirole, 1993 as prominent examples). If the agents are selfish and there exist asymmetries in the information between the politicians (the principal) and the bureaucrats (the agents), or between the regulator (principal) and the regulated firms (agents), then the structures of the regulatory process, i.e. the division of powers among different agencies, the scope of regulation, the way the bureaucrats are chosen, the way they make their decisions, and the dynamic and design of this process are fundamental elements to understand not only how regulatory decisions are made but also how they impact the market outcome.[6] The literature following this kind of approach exploded at the beginning of the 1980's, mainly around the so called "Toulouse School," and has produced an enormous amount of theoretical but also empirical contributions. In particular, the applied literature has dealt

[6]In this thesis I will not deal with the informational issues, which deserve a much deeper empirical analysis. However, my work connects, at least marginally, to this literature since I will explicitly consider the way in which the bureaucratic institutional design, i.e. the contract written by the politicians in order to influence and monitor the bureaucrats' actions, influences policy determination.

with the analysis of the effects of regulatory decisions on market outcome.[7] If we want to position this literature in the framework presented above, these studies analyzed the relation (3), i.e. the delegation process, the relation (2), i.e. policy incidence and, more precisely, how policy choice influences firms' behavior in the product market (relation (6)), but it did not consider how the political system shapes policy choices.[8]

The main critique of this approach is the lack of a positive analysis of the regulatory process. In particular, without considering that regulation is the result of a political process, in which the market-agents also take part, thus without considering its *endogeneity*, one cannot correctly determine the effect of such policy decisions. This point is strongly supported by my empirical results.

The political economy literature, on the other hand, has dealt with the development of models that explain the process of policy formation. In particular, following the so called "public choice critique to welfare economics" (see for instance Buchanan and Tullok, 1962 and, more recently, Besley and Coate, 2000a), the newest theoretical approaches criticize the assumption of a benevolent social planner that maximizes total welfare. Their starting point is an elected government that maximizes a utility function that may or may not contain consumer and producer surpluses, but where the selfish politicians also value the money/utility that they receive from interest groups.[9]

Since the end of the 1950's, many contributions have analyzed the role of political competition (Downs, 1957), the private interests of particular groups in society (Stigler, 1971 ; Peltzman, 1976; Becker, 1983), the role of politicians and voters' ideology (Kalt and Zuppan, 1984; Alesina and Rosenthal, 1995; Poole and Rosenthal, 1997), the role of political institutions (Persson, Roland,

[7] See Joskow and Rose (1989) and Winston (1993) for excellent surveys.

[8] Only recently the "agency approach" has been adopted to explain the positive side of the regulatory policy. See for instance Laffont (1996) and (1999).

[9] The presence of the total welfare in the utility function maximized by the politicians is not exogenously assumed as a sign of government's benevolence but rather motivated by electoral competition arguments. Politicians care about the aggregate welfare because this will increase their probability of being reelected. This literature, thus, give a microfoundation to the governments' utility function (Grossman and Helpman, 1994).

and Tabellini, 1997; Persson and Tabellini, 1999; 2001, and Persson 2001) and the role of transaction costs (Williamson, 1975; Dixit, 1996; Estache and Martimort, 1998). In the political economy tradition the role of the state and of political actors is then the core of the analysis, whereas the role of the market and its interactions with the political process are not really considered. Thus, the political economy literature explored the relations (3) and (4) represented in Figure 1.1, i.e. the electoral game and the lobbying process as well as the relations (1) and (5), i.e. the institutional and political determinants of policy formation.

In this thesis, I shall bridge between these two traditions and show the relevance of considering their interrelation. On the one hand, I will model the firms' strategic behavior in the product market assuming that the regulatory policy influences firms' interaction by shaping their operative environment. On the other hand, I will also consider that regulation is the endogenous outcome of a complex political process, where the institutional agents - such as governments and bureaucrats - and the institutional rules play a central role. The link between policy determination and policy incidence consists of considering the firm not only as a production but also as a political entity. Firms operate in the product market but also in the political arena, where they behave strategically in order to influence the design of the environment where they operate.

In what follows I will present a more precise review of the literature. Starting from the positive analysis of regulation as proposed by the "Chicago School", I will point out its main pitfalls and present possible solution to them, which arise from a generalization of the results stemming from the new political economy literature. I will then discuss in more detail the empirical approaches to economic regulation and the main results derived by this literature and point out the uncovered gap that my research wants to fill. Throughout the review I will briefly point out why this literature is relevant to my work and position my contributions in the larger framework of the existing studies.

1.3.1 Regulation and Political Economy

A positive approach to the study of regulation, which refuses the existence of a benevolent regulator, has been developed following the work of the "Chicago School" that elaborated the so called "private interest paradigm" (Stigler, 1971; Posner, 1974; Peltzman, 1976; and Becker, 1983).[10] Unlike the normative approach, this theory assumes that regulation, as well as other forms of governmental intervention, are simple redistributive processes among different groups in society. Thus, regulation exists because, through the regulatory process, some rents are generated and the selfish agents interact in order to distribute these rents among themselves (Becker, 1985). The private interest or economic theory of regulation then constitutes a theory for the demand of political intervention. The different groups in society ask for specific policies that preserve their interests. One of the main critiques concerning this approach is that it fails to successfully model the supply side for market intervention, namely the role of the entire political process and those subjects who decide upon policies. The political body is seen as a kind of "black box" through which the demand for policy intervention is transformed in policy prescriptions. Formal micropolitical models of the supply side of policy intervention, which should overcome the above mentioned pitfall, i.e. why and how are politicians influenced by interest groups, have been developed only recently in other fields of economic research, more notably public finance and trade theory (Grossman and Helpman, 1994 and 1996; Persson et al. 1997; and Besley and Coate, 2001).[11] Instead, there exists almost no microfounded model in the regulation literature, which formally questions the role of the relation between politicians and voters as the main mechanism to explain policy determination, and the role of lobbying groups in such a mechanism.[12] One of the main challenges of the new political economy literature has been to build general equilibrium models of policy formation with a strong microfoundation

[10] See Romer and Rosenthal (1987), Noll (1989), and Baron (1995) for very clear surveys of the modern positive theory of economic regulation.

[11] The two recent books by Persson and Tabellini (2000) and Grossman and Helpman (2001) provide excellent guidance to the literature on modern political economy.

[12] The very few exceptions are Faulhaber, (1997) and Trillas, (2000).

in order to explain the political process behind economic policy. The common assumption is that rational and selfish agents, who maximize their objective functions, strategically interact in the product as well as political markets. The observed policy is then the equilibrium outcome of a well specified non-cooperative strategic game built on primitive assumptions about the agents' preferences and about their political as well as economic behavior (Persson and Tabellini, 2000).

Of particular interest for my thesis is the analysis of special-interest politics recently developed by the political economy literature. The study of the role of pressure groups dates back at least to the theory of collective action developed by Olson (1965) and later to the work of Becker (1983 and 1985) on interest groups competition. More recently, this approach has also found a rigorous microfoundation for the rent seeking activity of interest groups or lobbies in the model by Bernheim and Whinston (1986a).[13] They developed a common agency model (see also Bernheim and Whinston, 1986b) where the lobbying process is represented as a menu auction and lobbyists make bids to politicians contingent on their future policy choice.[14] One of the most interesting results coming from this model, which is in line with the optimistic Chicago School's view of policy determination, is that the equilibrium policy outcome can be efficient also in the presence of selfish individuals, if each group in the society is equally represented in the political process.

The basic tool developed by Bernheim and Whinston has been applied by several authors in order to develop policy formation's models. One prominent example is Grossman and Helpman (1994), who used the menu auction approach to explain the structure of trade protection. They showed that interest groups may have a strong influence on the policy outcome and, in particular, that the competition intensity among groups determines their preferences over the policy outcomes.[15] Goldberg and Maggi (1999) and Gawande and

[13] An alternative approach, which dates back to Tullock (1967) and (1980), Krueger (1974), and Posner (1975) models the lobbying process as a contest. In the so called "rent-seeking" literature, individuals spend resources in order to increase the probability of winning a prespecified contested rent. See Nitzan (1994) for a very clear survey of the literature.

[14] See also Dixit et al. (1997) for an extension.

[15] See also Besley and Coate (2001) who analyzed the relationship between lobbying activi-

Bandyopadhyay (2000) empirically tested this theory and found that it seems to explain the observed trade barriers' structure much better than other more traditional trade theories did.[16]

One problem with this approach is that the existence of pressure groups has been exogenously assumed. Since Olson (1965), though, it has been recognized that, because lobbying activities can be considered a public good for the agents taking part in the group, there exists a coordination problem in the lobby formation: Which are the selfish agents' individual incentives to participate in a pressure group? Even though these individuals might realize their common interest - like for instance a favorable regulatory environment - they will, as a group, only achieve the optimal result if a mechanism that deters the free-riding behavior is available. Recently, several contributions have accounted for endogenous lobbying formation (e.g. Mitra, 1999). Some of these studies modeled the decision to form a group in a repeated game setup and analyzed the enforcement mechanisms, which could lead to cooperation in the political market (Pecorino, 1998 and 2001; Hillman et al., 2001, Damania and Fredriksson, 2000; and Ludema, 2001). The empirical literature, however, is still extremely scarce and much less progressed than the theoretical.[17]

In this thesis, I will make extensive use of the newest theoretical results to motivate and guide my empirical analysis, even though I will not structurally test any of the previously cited works. Particularly, I will address several of the questions arising from the lobbying literature. First, I will empirically enquire whether firms' lobbying activity has an influence on policy determination. I will show that lobbying strongly affects regulatory decisions, eventually having distorsive effects on the economy with respect to the outcome generated by a

ties and electoral process. Their main result is that the lobbying process does not necessarily strongly influence policy outcome, but that policy decisions may become inefficient because of the coordination problem faced by the lobbyists and because of other distortions implied by the lobbying activities.

[16] Also see Cadot et al. (1999) for an empirical analysis on the political economy of infrastructure investments, which uses the Bernheim's and Whinston's approach as well.

[17] See Potters and Sloof (1996) for an excellent review of the empirical literature on interest groups, and Potters and Van Winden (1996) for a survey on different theoretical approaches to model interest groups activities.

benevolent social welfare maximizing regulator. Furthermore, together with Astrid Jung we will also ask whether firms' product market behavior affects their decision to form a lobby, thus explicitly addressing the free-riding problem in lobbying formation. We will show that our empirical analysis supports this thesis and that firms's behavior in the product and political markets are strongly interrelated.

1.3.2 Empirical Analyses of Regulation

There exist a huge body of empirical literature in the industrial organization tradition that analyzed, over the last decades, the effects of different forms of regulation and deregulation on the market outcome.[18] In this Section, I will only concentrate on a small number of contributions which are particularly relevant for my study.

Winston (1993) provides a general overview of the analysis of the deregulatory process that took place in various sectors of the U.S. economy starting from the early 1980's. The main approach of the analyzed studies used the information generated by differently regulated industries to identify regulation's effects by contrasting the outcome of regulated and non-regulated markets. As a general result, it seems that deregulation has produced some positive welfare effects for the U.S. economy.[19]

Kriedel, Sappington and Weisman (1996) is a survey of the papers that analyzed the U.S. telecommunications industry and, in particular, the effects of the historical policy change from rate of return to incentive regulation. In the 1980's, incentive regulation was seen as a major reform towards a more efficient tool for policy making. Even though there is evidence that this regulatory regime's change had beneficial effects for firms' productivity and innovation speed as well as on the penetration rate of telecommunications services, there

[18] As a general reference, Joskow and Rose (1989) have thoroughly surveyed the literature over the effects of regulation on prices, cost structure, firms' efficiency, products' quality, and income distribution.

[19] See for instance Morris and Winston, (1986) and (1991) for the airline industry, Levin (1981) for the railroad industry, Crandall (1991) for the telecommunications industry, and Hazlett, (1996) for the cable television industry.

is no strong evidence supporting the fact that incentive regulation leads to lower prices for consumers and to a cost reduction for telecommunications services (Mathios and Rogers, 1989, Kaestner and Kahn, 1990), even though these latter factors were mentioned as the main reasons for this regulatory reform.

Yet, these studies have not asked why the regulatory reform happened and which were the forces driving it.[20] To put it differently, the political economy of the regulatory reform only attracted a very marginal interest in the empirical literature. The following quotation from Joskow and Rose (1989, p. 1498) makes clear the need for a more accurate analysis of the political economy of regulation:

> [..] This tells us simply that regulation has effects on various economic variables, that these effects have distributional impacts that create constituent interests, and that groups representing diverse interests respond in the political arena. Interest group politics is not, however, per se inconsistent with a "public interest" view of regulation (whatever that means) or with competing "private interests" theories. The work on the political economy of regulation must inevitably be carefully related to the effects of economic regulation and the way economic regulation is accomplished. The politics and economics of regulation are intertwined in a complex way. Further effort to fold more traditional analysis of the effects of economic regulation into analyses of the political economy of regulation seems essential.

Over the last decade, the interest for the political economy arguments that underlie the regulatory process has slightly increased, but the produced empirical evidence is still extremely scarce. Some authors have attempted to empirically analyze the determinates of particular regulatory decisions. Mainly, they concentrated on the analysis of a single industry and used data from the

[20] As stressed by Noll (1989) and Peltzman (1989) the political economy of regulation and deregulation might be different. Thus, to assume that the regulatory status is exogenous can have an impact on the estimates of the (de)regulation's effects.

U.S., since the cross sectional variation in policies among the federal states provides a sort of "natural experiment," which allows one to capture the effects of different regulatory regimes (e.g. Teske, 1991; Kaserman et al., 1993; Donald and Sappington, 1995 and 1997; and Kroszner and Strahan, 1999).[21]

However, these studies consider only one aspect of the regulatory process, namely the determinants of regulation, without questioning how the effects of regulation may also affect regulatory decisions. As I will make clear in this thesis, the interplay between economic and political forces and the process that leads to a particular regulatory policy decisions are elements that should simultaneously be considered in order to correctly estimate the effects of such a policy.[22] From the methodological point of view, this means leaving the typical approach of estimating one equation, and to address the simultaneity issue, i.e. the modelling of the regulatory process as a whole by using simultaneous equations systems.

1.4 Structure of the Thesis and Main Results

The thesis is divided into two parts. In the first chapter, which constitutes the first part, I present a cross sectional comparison of the deregulation process for the digital mobile telecommunications industry in OECD countries during the 1990's. The adopted approach is purposely "reduced-form" and consists of the estimation of a single policy equation. The focus is on the explanation of the regulatory policy determination, mainly from an institutional point of view and is more in line with the political economy approach. I concentrate on the ability of different political systems to produce policy changes as expressed by a reform of the regulatory policy, while the role of the market and of firms' strategic behavior is left aside. Merging several data bases, I test various predictions stemming from different strands of the literature. I analyze the role of political institutions (Persson and Tabellini, 1999 and 2001), government's types and ideological positions (Kalt and Zuppan, 1984 and Alesina

[21] Also, see Djankow et al. (2000) for an interesting cross-sectional empirical analysis of the political and economic determinants of entry regulation across country.

[22] On this point see also Besley and Case (2000) and Duso and Röller (2001).

and Rosenthal, 1995), industry and consumer private interests (Stigler, 1971; Posner, 1974; Peltzman, 1976), as well as the regulatory environment (Laffont and Tirole, 1990 and 1991) in shaping the regulatory policy. I find strong evidence that all these sets of variables help to explain some degree of variability in the observed liberalization patterns among countries. Yet, political and regulatory institutions and the pressure from strong incumbent firms are found to be the most important factors. While, on the one hand, these results were expected since they reflect the stylized facts partially observed in other fields of economic research, they must, on the other hand, be considered as new findings for the literature on regulation, which devoted until now only marginal attention to these topics. Beyond their empirical relevance, my results stress the need of a more accurate theoretical discussion that is still missing.

In the second part of the thesis, which comprises Chapters 3 and 4 and constitutes the most original contribution of my study, I focus on the firm's role and strategic behavior. The core of the analysis is on the interaction between the market and its political environment. In order to explicitly consider this relation, the econometric approach is more sophisticated and requires the use and estimation of simultaneous systems of multiple equations. Both studies reported in these chapters analyze the U.S. mobile telecommunications market during the second half of the 1980's, which presents a unique market structure and regulatory environment.

In the third chapter, I concentrate on the interaction between the market players and the political system. I consider that firms' lobbying activities which are aimed at obtaining a particular regulatory status, might generate a simultaneity problem between the effects and the determinants of regulatory decisions. Hence, I explicitly model this two-way causality, and empirically test this model in the U.S. mobile telecommunications industry. I find strong support for this approach: Regulatory choice should be considered endogenous. Accounting for the simultaneity bias, I show that regulation, whenever it actually took place, was not particularly effective in the sense that it did not reduce significantly cellular tariffs. However, I found that it would have been more effective if applied in those markets which had not been regulated. To explain this result, I show that firms' lobbying activities on regulatory choice

have been successful, so that firms were able to avoid regulation in those markets where it would have had a clearer impact on prices. From the political economy side, I also provide evidence that the probability of price regulation was higher, ceteris paribus, when the regulator was directly elected by the citizens, the state's governor came from the Republican Party, the government was politically stable, and when the regulation's opportunity costs were low. While the result that the regulatory and political environment are significant determinants of the choice for a regulatory regime was observed in other empirical researches (Teske, 1991; Donald and Sappington, 1995 and 1997), to the best of my knowledge there does not exist any paper, which makes the point of regulation endogeneity as proposed in this thesis. In fact, the adopted approach allows to build measures of the firms' private interests and to observe their effects on policy decision. Furthermore, I point out that the measurement of policy incidence is substantially different when regulation's endogeneity is taken into account. This result is of enormous practical importance, since policy conclusions from analyses that treat regulation as endogenous may be extremely misleading.

The fourth chapter, which is a joint work with Astrid Jung, focuses on the strategic choice made by the firms in different markets (Baron 1999 and 2001). We make the point that firms' behave strategically not only in the product market, but also in the political market, and investigate the relationship between firms' lobbying expenditures and product market collusion (Damania and Fredriksson, 2000 and Ludema, 2001). We develop an empirical approach which allows us to structurally estimate the market interactions and to simultaneously account for the endogeneity of lobbying decisions. Measuring firms' political activity as the amount of campaign contributions by the mobile telecommunications industry, we find a significant negative relationship between the strength of collusion in the product market and firms lobbying expenditures: A collusive conduct decreases political activities, while higher rent seeking efforts increase competition in the product market. The interpretation is that market collusion eases interest group formation and reduces the competitors' conflict with regard to policy choices, thereby limiting the politicians' ability to extract rents from the firms. Even if there is some empirical

evidence that industry concentration has an impact on firms' decisions to form a group or not (Pittman, 1988 ; Zardkhooi, 1985; Grier, Munger, and Roberts, 1991), we are not aware of any empirical study which analyzed the relationship between collusion and lobbying decisions. We believe that the strong and robust empirical relationship observed in our results is an important step in understanding firms' behaviors, which should stimulate further theoretical as well as empirical research.

Overall, the methodological contribution of this thesis is to explicitly model the endogeneity of the political market in the analysis of regulatory processes. The development of two new and rich databases, which allow for the empirical implementation of the simultaneity between the product market and the political arena, must be considered a further contribution of this work. The need for high quality data in this field of applied research is, in fact, enormous, and these new datasets constitute without any doubt an excellent basis for the development of further research on the political economy of regulation. The empirical findings reported in this work strongly support the proposed approach: Regulation must be regarded as endogenous. The role of political forces and institutions must be taken into account in the positive analysis of regulation as well as of other forms of economic policy. The firms do interact in the product and political markets and must be considered not only a productive but also a political entity. The theoretical and empirical research in the field of industrial organization must confront itself with this robust evidence and propose new tools to deal with it. Still, this thesis must be considered only as a first step towards a more ambitious research program, which should be the basis for the political economy of industrial policy.

Part I

The Political Economy of Deregulation: The Role of the State

Chapter 2

On the Politics of the Regulatory Reform: Econometric Evidence from the OECD Countries

> "Economic deregulation [...] is one of the most important experiments in economic policy of my time." Winston (1993, p.1262)

> "[T]he allocation of entry rights will be based in part on political considerations - a politically determined division of the rents - as well as economic efficiency." Noll (1989, p.1274)

2.1 Introduction

In the past 20 years, the majority of industrialized countries have experienced an era of deregulation. Many industries, which for decades were guided by the state's hand, have been opened up to competition. Especially in the so called network industries - such as the telecommunications, airline, post, and electricity industries - the market structure and regulatory instruments have

been widely reformed.[1] On the one hand, governments have tried to implement more competitive market structures through the liberalization of entry and the privatization of the typically state owned incumbent operators, while on the other hand, following the developments in the economic literature, new regulatory designs were introduced with the aim of improving the effectiveness and efficiency of governmental intervention in the market.[2]

The speed, timing, and extent of these reforms among OECD countries, however, have been remarkably different. Why did some countries liberalize more and quicker? What have been the determinants of such reforms? I will answer these questions by analyzing some new data on the regulatory reform undertaken during the 1990's in the OECD countries. The analysis that I will propose is essentially positive and descriptive, but I acknowledge that a deeper understanding of the process underlying the regulatory reform is essential for a correct understanding of the effects of such reform, since effects and determinants of regulation should be simultaneously considered.[3]

According to the "public interest" view of public policy, one should observe regulation because market failures generate inefficiencies, which could be alleviated through benevolent governmental intervention.[4] Following the path breaking contribution by Stigler (1971), many scholars criticized this approach as unrealistic, and questioned the appropriateness of assuming a benevolent government. The alternative view interprets that regulation is essentially a redistributive process among self interested subjects who want to gain specific benefits by means of governmental intervention.

[1] See for instance Bergman et al. (1998), a report on the development of European deregulation especially concerning the telecommunications industry. For a survey on the history of deregulation see Winston (1993) and Chang (1997).

[2] As Winston (1993) pointed out, the role of economic research in the field of regulation has been crucial. He noted (p.1263): "deregulation would never have occurred if economists - especially microeconomists - had not generally supported it through their research."

[3] See Duso and Röller (2001) and Chapter 3 of this thesis for a deeper analysis of this point.

[4] The 'welfare economics' approach to government intervention is essentially normative, but it would entail a positive theory of government under particularly strong assumptions such as complete information and the absence of transaction costs (Noll, 1989).

Although some contributions have exploited the role of different political factors in shaping the regulatory policy, a well defined micropolitically founded theory of regulation has not yet been fully developed. Nevertheless, there exists a new and fast growing literature on the political microfoundation of economic policy - what Persson and Tabellini (2000) call *political economics* - which is closely related to and shall be helpful when trying to reach a deeper understanding of the politics of regulatory policy.[5] During the 1990's, plenty of political economy models have been developed, each focusing on particular issues of the "political game" with the aim of determining how different factors influence economic policy. The role of political institutions, the governments' types and viability, the politicians' ideological and programmatic positions, the private interest and lobbying activities by pressure groups, and the regulatory agencies' institutional design have been analyzed.

Following this renewed theoretical interest, the empirical literature on the politics of economic policy has found a new impulse as well, but it still remains at its infancy. In this chapter I provide a comprehensive glance at new data on international regulation, thereby contributing to the debate on the politics of the regulatory reform by offering some new and robust stylized facts. I adopt a reduced form empirical approach to explain the cross-sectional and time-series variation in the degree of liberalization and regulation of the mobile telecommunications industry of the OECD countries during the 1990's. Merging different data bases, I empirically analyze predictions stemming from a rather heterogenous literature, aiming at "testing" which of these approaches can better explain the observed regularities. I uncovered a number of stylized facts about the (de)regulation of the mobile telecommunications industry. I show that majoritarian countries, countries with more accountable regulators, and countries with right-wing governments liberalized more, whereas countries with proportional electoral systems or consensus-type of democracies, with a presidential regime, with coalition rather than one-party governments, and with a strong incumbent firm liberalized less.

The chapter proceeds as follows: Section 2 provides a brief review of the

[5] Also, see Grossman and Helpman (2001) for a microfoundation of economic policy.

related literature. In Section 3, I give a theoretical framework for my analysis by introducing political and economic factors, which have been proposed as explanatory variables for regulatory policy. Section 4 deals with the description of the database obtained by merging many different sources. In Section 5, I develop the main econometric model and discuss some methodological issues. I present the results in Section 6 and conclude in Section 7, where I present summary remarks and suggest directions for future research.

2.2 Related Literature

The starting point for reviewing the literature on the political economy of regulation is the private interest view also known as the *economic theory* of regulation (Stigler, 1971). This approach stresses the role of interest groups in determining governmental intervention. Regulation is seen as a political process, whose structure has not been formally modeled, in which specific interests express their demand for political intervention as a way of redistributing rents to themselves.[6] The presence of market failures generates these rents, and their distribution among the different represented subjects depends on their relative strength (Peltzman, 1976).[7] The consequent redistribution can be efficient if all interests are equally represented (Becker, 1983).[8] This theory predicts that different groups in the population should try to "capture" the

[6]Stigler's definition of economic regulation was quite broad, essentially including all governmental economic acts.

[7]The original Stiglerian approach was a one-way capture theory: industry interests are the sole ones to be represented in the political outcome. Peltzman (1976) went beyond this simple capture theory, and stressed the role of the regulator as the institution that mediates between consumers' and producers' interests. Finally, Becker (1983) extends this dichotomous trade-off to the case of competition among interest groups.

[8]Bernheim and Whinston (1986a) formalized the lobbying process through an agency framework, in which the represented interests placed bids contingent on their favorable policy outcome. This model was applied in several studies to explain economic policy. For instance, Grossman and Helpman (1994) analyzed trade protection in such a framework; the predictions of their model have been very successfully supported by the empirical evidence (Goldberg and Maggi, 1999 and Gawande and Bandyopadhyay, 2000).

agency.[9] Therefore, one should expect to observe variables related to these interest groups' strength, size, and organization to significantly influence the observed regulatory pattern.[10]

The economic theory of regulation suffers however from several pitfalls. The first problem concerns its failure to model the political process through which private interests are materialized in particular policy prescriptions. Essentially, the supply side of regulation is taken as exogenous, like a black box through which the demand for regulation is transformed into outcome. Yet, the supply side of the regulation market, namely the entire public sector policy-making technology (politicians, governments, legislators, regulatory agencies, courts, etc.), must be considered in a micropolitically founded theory of governmental intervention, since these actors create, shape, and monitor the regulatory process.[11]

Recently, a new theoretical and empirical literature in economics has dealt with the analysis of the role of political institutions in shaping economic policy.[12] For instance, it has been shown theoretically as well as empirically that the regime type and the electoral rules not only shape a government's size and expenditures (e.g. Persson and Tabellini, 1999 and 2001; Milesi-Ferretti *et al.,* 2001), but also the tax rate and income distribution (Austen-Smith, 2000). In this study, I apply this kind of thinking to regulatory policy, because the rational of the aforementioned literature, namely that the conflict redistribution among different interested agents (and thus the policy's determination) depends on political institutions, should also hold for the regulatory governmental interventions, even if a well specified theoretical model has not been

[9] See Laffont and Tirole (1991) and (1993) for a theory of regulatory capture. Their focus is, however, on the optimal agency design in a world with asymmetric information.

[10] For empirical analyses of interest groups' pressure on regulatory decisions see Kroszner and Strahan (1999) and the third chapter of this thesis. Also see Potters and Sloof (1996) for an excellent survey of the empirical literature on interest groups' influence.

[11] The political theory of economic policy recently proposed by Laffont (1999), which is based on the well developed incentive or principal-agent theory, may be seen as a possible way to formalize the supply side of regulation.

[12] Political scientists have thoroughly analyzed political institutions's role in shaping policy formation. See for instance Lijphart (1999).

developed yet.

The second pitfall of the private interest theory of regulation is that it has been very successful in explaining regulatory intervention but, as many authors pointed out (e.g. Peltzman, 1989 and Noll, 1989), has failed to explain the deregulation process, a phenomenon that, from the 1980's onwards, has been widely observed in many industries and countries. One possible alternative approach, which has been stressed in political science, is that the ideological position of the policy makers also matters for policy determination (e.g. Kalt and Zuppan, 1984; Hibbs, 1987a and 1987b; Poole and Rosenthal, 1993; Alesina 1987; Alesina and Rosenthal, 1995; Cusack, 1997; Irwin and Kroszner, 1999): Politicians make their choices according to their political preferences, because they care for the policy outcome itself. Although it may be problematic to consider the ideological position of politicians and voters as an exogenous determinant of economic policy (Poole and Rosenthal, 1993), I am interested in analyzing whether there exists any kind of relationship among these issues.

Finally, the private interest theory of regulation, by implicitly assuming that the regulator is a mere and neutral reflection of the political process generated by the legislator, denies the agency problem entailed in this relationship. However, as the following quote from Noll (1989, p.1255) points out, the organization of the regulatory process is surely an important factor to account for:

> "Regardless of the motives of political actors, an essential ingredient to a theory of regulatory policy when the Coase theorem fails [i.e. when there are imperfect information and transaction costs] is how political officials control agencies. Whether the aim of regulation is to maximize efficiency or to transfer wealth to a special interest, politicians face a principal-agent problem in trying to assure reasonable bureaucratic compliance with the objectives behind a legislative mandate."

This agency problem behind the regulatory structure has been thoroughly analyzed in the literature (e.g. Baron, 1988; Spiller, 1990; Laffont and Ti-

role, 1990 and 1991; Laffont, 1996 and 1999; Laffont and Martimort, 1999).[13] Among other elements this view stresses that the independence, accountability, and transparency of the regulatory process are important factors, which could help to explain the role of the agency relations between the different subjects (Neven *et al.*, 1993).

At this point, I have predictions coming from a rather heterogenous literature that have dealt, in the last 30 years, with the intriguing topic of the politics of regulation or, more generally, of economic policy. The contribution of this study is to take some of these predictions to an empirical test, using a particularly suitable and new data set.

There are two recent papers, which are very closely related to my approach both in their motivation and in their econometric analysis. Djankov *et al.* (2001) analyzed the regulation of the entry of start-up firms in 75 countries. Their analysis concentrated on the bureaucratic requirements that a firm has to accomplish in order to set up a new business. They contrasted the predictions from different theoretical approaches and tested them on new data collected by the World Bank. The main results of the paper are that the public interest view of regulation is rejected by the data, the Stiglerian Approach finds some support, whereas a "tollbooth view" of economic policy - where regulation is pursued for the benefits of politicians and bureaucrats (De Soto, 1990) - seems to explain the cross-sectional variation in the costs and time necessary to start-up a new business much better.

Li *et al.* (2001) is a cross-sectional empirical analysis of the political economy of privatization and competition, which uses a new data set from the telecommunications sector built from different sources like the World Bank, Pyramid, and the ITU (International Telecommunications Union). They also adopted a reduced form approach based on a generalized private-interest framework, and concentrating on the role that interest groups have in shaping the regulatory process. This theory seems to receive reasonably strong support from the data. Furthermore, since the data set contains many countries, they could contrast the experiences in democratic vs. non-democratic countries, in

[13] Fiorina (1982) proposed an alternative approach to the delegation of regualtory authority based on the uncertainty about costs and benefits of regulation.

order to assess the role of democracy in shaping private interests' ability to influence the policy reform.

Both studies, which surely are an important step in filling the lack of empirical research on the political economy of the regulatory reform, do not investigate the role of political and regulatory institutions.[14] As stressed by other authors (Noll, 2001; Levy and Spiller, 1996) institutions in place and the rules governing the decision making process play a crucial role in that they constrain the set of policy choices, and thus, determine the outcome of the reform process (McCubbins *et al.,* 1989).

Also relevant for my research are a set of recent OECD working papers (Boylaud and Nicoletti, 2000; Gonec *et al.*, 2000 ; and Nicoletti, 2001). While they are closely related to this work because part of the data they use are also used in this work, they differ in their aim, since they analyze the effects rather than the determinants of regulatory reform.[15] The main message of these studies is that the observed reforms of the regulatory environment could contribute substantially to improve economic performance, but that a large scope for further reform exists. This study will build a counterpart to these studies based on the political economy view, as a first step of a more ambitious research program in which determinants and effects of regulatory reforms are being simultaneously analyzed.[16]

One last comment is to be made at this point. The term *regulation* has been intentionally used rather generally during this introductory discussion. In the following sections, I shall be more precise about what I mean by *regulatory reform*, especially when describing the data. However, what I am attempting here is to think in quite general terms about the politics of the regulatory process, which entails regulation, re-regulation, and also deregulation. I believe, in fact, that a political economy theory of regulation should be able to encompass all these processes.

[14]Pryor (2002) is another empirical analysis of governmental regulation in OECD countries.

[15]See Gruber and Verboven (2001) on the effects of entry and standard regulations on the evolution of cellular markets.

[16]Duso and Röller (2001) is a first step in this direction.

2.3 Theoretical Motivation

The approach taken in this Chapter consists of the estimation of reduced form relationships with a descriptive aim. I will not structurally test one particular theory, but rather I want to ask, looking at new data, whether different sets of political variables systematically influenced the regulatory process undertaken in the mobile telecommunications industry during the 1990's in most of the OECD countries. I am looking for some stylized facts that help me to understand which political factors drove this reform process. In this section, I present a theoretical background and derive testable hypotheses for the empirical analysis.

2.3.1 Regulation, Institutions, and the Government

Political scientists have focused on the analysis of the role of political institutions in shaping political phenomena. Recently, this "comparative policy approach" has also been used in economics in order to analyze the role of political institutions in shaping economic policy.[17] As noted by Austin-Smith (2000, p.1257):

> "[..] political "institutions matter" because the institutional differences are reflected in differences in the incentives of political agents to appeal to particular groups of voters who typically have distinct economic opportunities and, therefore, distinct preferences over economic policy."

Persson and Tabellini (1999) and (2001), Persson (2001) and Milesi-Ferretti *et al.* (2001) have theoretically and empirically analyzed whether the electoral

[17] The comparative policy approach is positive and aims at comparing different equilibrium outcomes derived under different assumptions about the political institutions in place, which are considered to constitute the exogenous "rules of the game." Differently, the approach taken by Laffont (1999) is normative and aims at endogenising the institutional details, under the assumption that a "benevolent dictator" exists, who optimally designs institutions under imperfect information.

rule and regime type influence fiscal policy and public spending. Their empirical findings, which are mainly based on their theoretical results, suggest that political institutions shape economic policy.

Yet no developed theoretical model suggests a systematic microfounded relationship between regulatory intensity and the institutions in place, even though some political models of regulation have already stressed the importance of the decision making's structure and, in particular, the agency problem between different government and bureaucracy levels.[18] I believe that some new empirical evidence, such as stylized facts, will help in deepening the understanding of these phenomena, and perhaps will stimulate a renewed theoretical discussion on this topic.

One characteristic of the telecommunications industry is that the range of users covers almost the entire population. This could imply that the regulation of utilities is a policy that might interest a large base of voters, hence it might be considered to be a broad policy program. While this seems to be plausible for the wireline telecommunications industry, it may be much less true for the cellular telecommunications industry, especially in its early phase, during which cellular services were still not extensively adopted. There are then some specific groups of the population - namely business people and young people - which mostly benefit from a competitive mobile telecommunications industry. In the empirical analysis, I concentrate on the mobile telecommunications' entry regulation or liberalization, thus I assume that this kind of policy is perceived to be a targeted policy.

From the theoretical literature mentioned above, I borrow the idea that countries with majoritarian elections should be expected to implement more specific and targeted policies. This is because smaller districts, which are generally associated with this kind of electoral rule, foster more competition to capture the support of particular voters. This prediction should also be reinforced by the fact that politicians internalize less of the positive effects

[18] See Levy and Spiller (1996) for an interesting but less formal analysis of the impact of political and social institutions on regulatory structure and performance. Also, see Noll (2001) on the politics of regulatory reform in developing countries, and Laffont and Tirole (1990) and (1991) for more formal theoretical analyses.

of a broad program, since the electoral districts in majoritarian elections are smaller. My first prediction is that in the mobile telecommunications industry one should observe more liberalization in majoritarian than in parliamentarian regimes.

It is harder to make a clear cut prediction for the second kind of institutional detail: the regime type. One of the major differences among different regime types concerns the separation of powers. Presidential regimes are usually associated with a strong division of power between parliament and government. In presidential regimes the government is normally more accountable and can less easily abuse its power (Persson, Roland, and Tabellini, 1997). An implication of this is that in a presidential regime, since there is a relatively less stable majority of legislators that pursue the interests of the majority of voters, the opposing interests of smaller minorities may compete with each other, leading as a result to the choice of broader programs (Persson, 2001). Stretching this conclusion perhaps too much, I would then expect to observe less liberalization in the mobile phone market in presidential regimes.

Hypothesis 1 *If mobile telecommunications' entry liberalization is perceived as a targeted policy program, countries with majoritarian elections should liberalize more, whereas presidential regimes should liberalize less.*

However, one should be cautious when extending the predictions stemming from the model developed in public finance to the regulatory reform case. First, because, as we saw, it is difficult to assess how targeted this policy intervention should be considered, and second, because I cannot be sure that the mechanisms driving the results in the public finance models also hold in a political economy model of regulation.

Since the dichotomous representation - majoritarian vs. proportional elections and presidential vs. parliamentary regimes - seems to be too simplistic to account for the enormous variety of a country's formal and informal institutions, and in order to improve the quality of the analysis, I will also use other measures for political institutions. In his influential study on democracy, Arend Lijphart (1999) showed that democracy's typologies can be reduced to a clear

two-dimensional pattern along two institutional dimensions: the executive-party dimension and the federal-unitary dimension.[19] Both indexes show how *majoritarian* and *consensual* countries are along the two chosen dimensions, which account for the division of powers between government and parliament (executive-party) and between different governments's levels (federal-unitary). Compared to the previously presented institutional dummies, these two new variables are a metric measure of richer information for institutions.

In this case, I do not have a microfounded model, which predicts how these institutional details affect policy.[20] Yet, there exists a number of contibutions in the political science literature, which stress the role of veto players in influencing policy reform. In particular, Tsebelis (1995) showed that the potential of policy change decreases with the number of veto players.[21] Since more majoritarian regimes in Lijphart's sense face less veto players in both dimensions, the prediction should be that majoritarian democracies along those dimensions should be better able than consensual democracies to implement policy reform.

Hypothesis 2 *More majoritarian democracies along the executive-party and the federal-unitary dimensions are expected to be more effective than consensual democracies in implementing policy reform.*

A second kind of institutional variable that one can consider is related to the government's type. This institutional detail is of course related to the electoral system as well as to the regime type of which it is a by-product. Nevertheless, one still can analyze whether they have a direct impact on regulatory policy. I consider two different government types: one-party vs. coalition gov-

[19]The two indexes were obtained by aggregating information from ten different political dimensions by means of factor analysis. We refer interested readers to Lijphart's book for a very clear and deep analysis.

[20]Lijphart (1999) showed that these measures of consensus democracy have a significant impact on many macroeconomic performance variables. In particular, he showed that consensus democracies have done better than majoritarian democracies, especially with regard to the control of inflation.

[21]He also showed that the potential for policy change decreases with the incongruence and internal coehesion of veto players. An interesting empirical analysis of the veto players' theory is provided in Tsebelis (1999) .

ernments.[22] Moreover, I want to observe whether the government's political support and the opposition's fractionalization play a role in shaping the economic policy. In fact whether a government is viable, i.e. able to effectively govern and implement policies that depart from the *status quo*, also depends upon the composition of the legislature, and in particular on how strongly the government is supported by the legislature.[23] I can than state the following claim:

Hypothesis 3 *Coalition governments are expected to push the regulatory reform and the liberalization process less than one-party government.*

2.3.2 Ideology and Partisan Politics

In the partisan politics tradition, politicians or political parties choose their policies not only in order to be reelected like in the electoral competition models, but rather because they care about the policy outcome as well. This implies that the platforms of the different politicians may not converge to the median voter's preferred policy, and may instead be driven by partisan preferences, which should represent the interests of their constituencies (Alesina and Rosenthal, 1995).

Although many scholars argue that in modern industrialized countries ideology has lost its role in shaping policy, there exists some evidence that partisanship matters, although it is not always clear *how* it matters. Poole and Rosenthal (1993) showed that roll call voting in the U.S. Congress is

[22] As Alesina and Rosenthal (1995) stressed, the dichotomy "one party vs. coalition government" in parliamentary democracies parallels the idea of "unified vs. divided government" in presidential systems. The division of power can be used by voters to assure a moderation of the government's policy. Moreover, coalition governments, having more veto players, should face a more persistent *status quo* bias (Alesina and Drazen 1991) .

[23] As we already mentioned, according to the existing empirical evidence, regulatory policy seems to have a great degree of inertia (Joskow and Rose, 1989 and Faure-Grimaud and Martimort, 2000). Regulatory policy seems, in fact, to react only to major political shocks rather than to changes in economic factors. The departure from the *status quo* may be, for this kind of policy, even more difficult than for others.

very well explained by ideology as expressed by the unidimensional "liberal-conservative" measure and, furthermore, that such dimension is intertemporally stable.[24] Rosenthal and Romer (1987) gave some examples of how this unidimensional measure of ideology is well in line with the Congress' voting behavior on specific regulatory issues. Extending these arguments to a cross-sectional comparison across countries, I argue that the "right-left" dimension should also explain regulatory patterns in OECD countries.[25]

Hypothesis 4 *I expect to observe that left-wing governments tend to liberalize less than right-wing governments.*[26]

Yet, one legitimate question is whether the right-left dimension is a sufficient statistic for the parties'/governments' ideological position on particular issues, or whether information about the programmatic position on these particular issues does a better job in explaining policy variation. In my case, I can use some interesting measures of the governments' programmatic position on issues such as regulation and welfare state limitation, and hence analyze how the right-left variable's significance level varies after inserting such measures as regressors. In a sense, this is a test of the explanatory power of the right-left synthetic measure.

2.3.3 Private Interests

The private interests theory of regulation stresses the role of competition among interest groups in shaping economic policy. If all parties are equally

[24] As Romer and Rosenthal (1987, p.111) pointed out: "[...] ideology is a dimension on which are projected the myriad issue dimensions of politics. It is a remarkable fact that a single dimension, with considerable stability, characterizes voting in the U.S. congress. [...] voting in a manner consistent with ideological location may well be consistent with close attention to constituents interest".

[25] As Thomas Cusack (1997) points out, "Lower income groups and labor in general [i.e., the "left"] are seen as favoring a large and active state. This is a state heavily engaged in regulating the market and using public finance to equalize the outcomes of market operations."

[26] On the other hand, one could expect right-wing governments, which should be more "pro-business", to regulate entry more heavily in order to protect the interests of those firms, which are already in the market.

represented, the tougher this competition is, the more efficient the policy outcome should be. Generally, though, the industry has more intense and better organized interests than, for instance, consumers, who are also affected by regulatory reforms and whose interests are often opposite to those of the industry (more competition to foster lower prices, higher quality, and more product diversity). Consumers, in fact, face the typical free rider problem in group formation (Olson, 1965), hence their lobbying activity might be less effective than the lobbying by telecommunication firms that already operate in the market, which are few and whose interests are more aligned. Among firms, though, there can also be strong differences. Incumbents should be more interested in protecting their market from new entry, calling for a tougher entry regulation. On the contrary, potential entrants should lobby to lower entry barriers and to push forward the liberalization process.

In this chapter, I will analyze this kind of mechanism, at least partially. the expectation is that the higher the incumbents' market share, the more resources it should spend in order to slow down the liberalization process. These firms have in fact much to loose in a liberalized environment. On the other hand, when the industry profits are high, then the entrant firms' lobbying intensity should be higher, since the gain from lobbying - i.e., the possibility to enter a profitable market - is higher.[27] Finally, from the consumers' side, I use the "active" population, i.e. the population between 15 and 64 years, as a proxy for the consumers' interests. Relative to the entire population, adolescents and people in the labor force, in fact, would gain from a liberalization of the mobile industry. The reason is that liberalization should imply a more competitive environment with lower prices and these groups are the main potential users.

Hypothesis 5 *Countries are more likely to liberalize when the incumbent's market share is low, industry profits are high, and the proportion of "active" population is high.*

[27] This is by no means a perfect measure for potential entrant's interests, since high profits are also in the interest of the incumbent firm. However, one can hope to capture the former when controlling for another measure of the incumbent's interests, such as its market share.

2.3.4 Regulatory Institutional Environment

The regulatory institutions in place are the result of a delegation process involving politicians and bureaucrats. As already mentioned, this relationship has been widely analyzed in the theoretical literature. Nevertheless there is little empirical evidence helping to evaluate this theories. The government writes contracts that should entail the "right" incentives for bureaucrats to operate efficiently. This analysis, however, is beyond the scope of this chapter. I will assume that the institutions that result from these contracts shape economic policy decision.[28]

One problem in this specific case is that regulatory institutions in telecommunications have been partially reformed during the sample period, and sectorial authorities were created to handle the liberalization and privatization processes. In my approach, instead, I assume that regulatory institutions remained constant during the sample period, since the information contained in the OECD database does not follow their temporal evolution, but rather gives a picture of them around the end of the sample. Nevertheless, I think that it is useful to incorporate these variables in this study, in order to stimulate the discussion, but keeping in mind that a deeper and more careful analysis is needed.

There are essentially two main regulatory agency's characteristics, which have been pointed out as particularly important for explaining their ability to implement regulatory policy: their independence and accountability. The argument about regulator's independence from the political power that appointed it is that such independence should help to ease the regulatory capture problem (Laffont and Tirole, 1993). First, a more independent regulator should face a less severe time inconsistency problem, because it is less concerned with electoral cycle considerations. Second, a more independent regulator should more likely purse the general interest, because it is less dependent on a captured government. The argument behind the idea to keep agencies more accountable

[28]The theory of regulatory capture proposed by Laffont and Tirole (1993) stresses the role of the regulatory environment in shaping interest groups' ability to influence the regulatory policy. Regulatory institutions should then be designed in order to minimize the possibility of regulatory failure.

is that this accountability should "counterbalance the natural inequality in the ability of different interest groups to influence regulatory practice, including the well-known tendency for consumer interests to be less well organized than those of producers" (Neven *et al.,*. 1993). If this is true, then one should expect to observe a more pronounced liberalization pattern in those countries where the agencies were more independent and more accountable.

Hypothesis 6 *Countries are more likely to liberalize when their regulatory authorities are more independent and more accountable.*

2.3.5 Demographic and Economic Controls

I control for specific demographic and economic characteristics, which are supposed to constitute a source of observable heterogeneity among countries, such as the population level and the income per capita. Indeed, a correlation between higher income per capita, good government, and lower need for regulation is likely to exists.[29]

In general, I make these controls in order to account for the country's demographic and economic conditions, which may shape the economic policy decision (Besley and Case, 2000). Furthermore, one can think of these controls as accounting for the differences in the market conditions among countries. For example, I expect that small countries - such as Luxembourg - do not have a competitive market structure, because they constitute a natural monopoly since potential demand is very small. Finally, I also control for a time trend, which should capture the market evolution and technological change. These have been important elements for determining the development of the mobile telecommunications industry and its regulation.

2.4 The Data

Our data set, merged from different databases, constitutes an unique source of information for analyzing the politics of regulation. On the one hand, it

[29]See Djakanov *et al.* (2001). A reason for this could be that richer countries may deal better with market failures than poorer.

contains information about the regulatory process, market structure, and regulatory environment in OECD countries; while on the other hand it has information on these countries' institutional and political environment.

The regulatory variables are taken from a database on international regulation recently published by the OECD (see Boylaud and Nicoletti, 2000; Gonec *et al.*, 2000; and Nicoletti, 2001). The database consists of primary data, provided mainly by means of ad hoc questionnaires and existing OECD publications. Furthermore, some indicators were estimated to facilitate the use of the detailed aggregated data and to allow comparisons between countries with different regulatory systems. The primary data consist of qualitative information (such as binary answers, multiple choice answers or answers providing more detailed information about regulatory provisions) as well as quantitative information (such as number of licenses, market shares and industry performances). Additionally, there are general reports about the regulatory environment in and around 1998.

Figure 2.1 displays two indexes on the regulatory intensity in the fixed line and mobile telecommunications industries developed by Boylaud and Nicoletti (2000), which were calculated aggregating different information through a factor analysis and represent an average over the period 1991-1997.[30] So, for instance, the UK presents the lowest regulatory intensity in the wireline and the mobile telecommunications industries. On the other extreme, Turkey and Switzerland regulate the most.

The most interesting element, which emerges from the previous figure, is the high level of heterogeneity in the regulatory processes among OECD countries. Figure 2.2 plots the index on regulatory intensity in the mobile telecommunications industry and the degree of liberalization of the digital mobile telecommunications industry.[31]

[30]The "0" means high regulatory intensity while "1" means low regulatory burdens. The regulatory index for the mobile industry aggregates information about the internationalization, the liberalization and market structure of the domestic mobile telecommunications market, while the regulatory index for the fixed telephony considers also the state ownership of the PTO. We are very grateful to Giuseppe Nicoletti for sharing his data.

[31]In the figure the time average of the variable **DIGITLIB** is represented for each country. This variable takes value 1 if the market is a monopoly, 2 if it is a duopoly, and 3 if the

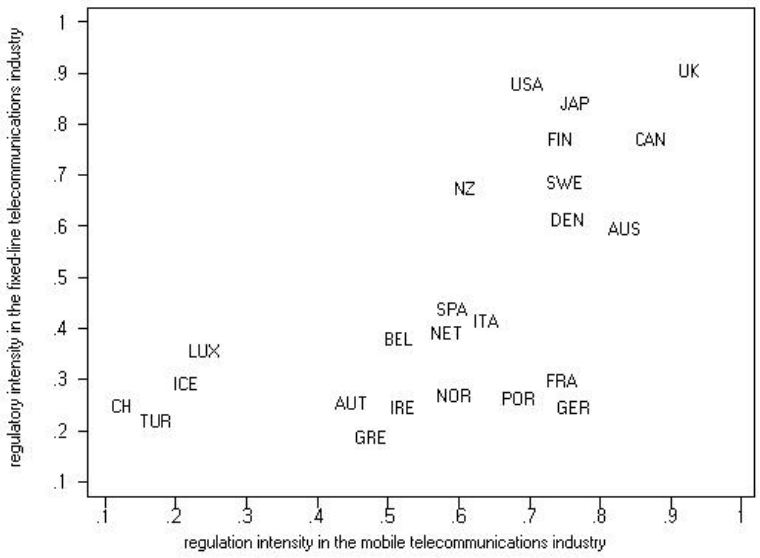

Figure 2.1: Regulatory Intensity in the Wireline and Mobile Telecommunications Industries

Also in this case, one observes a great deal of heterogeneity among countries, with the UK on the top-right corner (competitive industry with low regulatory intensity) and Switzerland on the bottom-left corner (monopoly and high regulatory intensity).

Moreover, looking at Figure 2.3, which plots the time evolution of the cross-sectional average of the degree of liberalization between 1991 and 1997, one also observes variability in the time dimension, which suggests that the deregulation and liberalization of the telecommunications industry was an ongoing process during the sample period. I aim to explain both sources of variability in observed policy.

The second database that I use, which is the main source for the "political side" of the data, has been developed by the *Institutions and Social Change'*s Unit of the Wissenschaftszentrum Berlin für Sozialforschung (WZB). The original data base was first built by the *Manifesto Research Group* of the *European*

market is more competitive (3 or more firms).

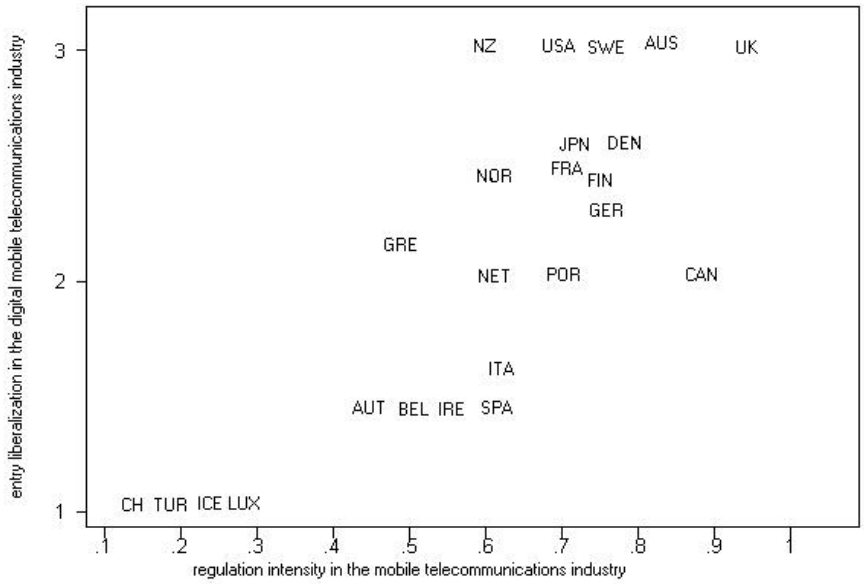

Figure 2.2: Degree of Entry Liberalization and Regulatory Intensity in the Mobile Telecommuncations Industry.

Consortium for Political Research (ECPR) and was later developed at the WZB in the so-called "Comparative Manifestos Project" (CMP). In this dataset, various aspects of the party and governmental system are examined on the basis of quantitative content analyses of party manifestos and government declarations. The original collection includes 2,359 manifestos from 614 different parties in 461 national elections between 1945 and 1999. This originates from 52 countries, including all OECD countries with the exception of Korea and 24 central and eastern European countries (see Budge *et al.,* 2001). Furthermore, these original data have been extended to cover information about the elected governments during the sample period. This information, which has been derived from Woldendorp, Keman, and Budge (1998), has been subsequently extended and corrected at the WZB.[32]

Our data on political institutions is based on two sources. On the one hand, I use two dummy variables developed by Persson and Tabellini (1999),

[32]I am particularly grateful to Andrea Volkens for kindly providing me with this data.

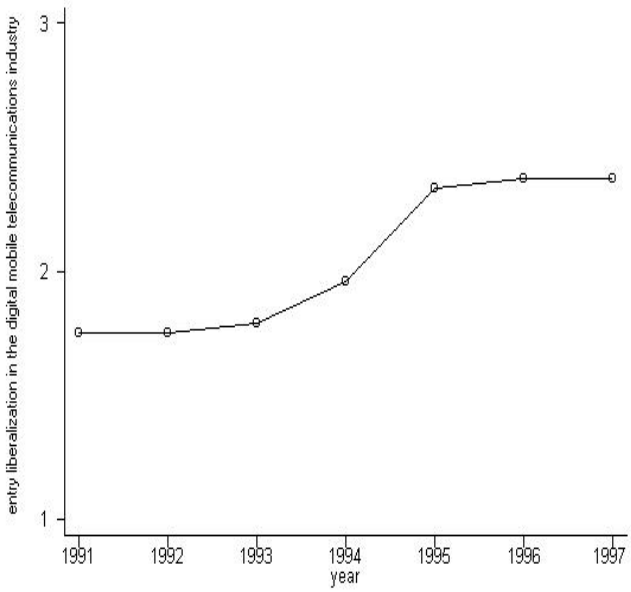

Figure 2.3: Time Evolution of Entry Liberalization in the Digital Mobile Telecommunications Industry

which take value one for countries with majoritarian elections (**MAJOR**) and presidential regimes (**PRES**).[33] On the other hand I use the two indexes (**EXEC_PAR** and **FED_UNIT**) developed by Arend Lijphart (1999) that I presented in the previous section. These indexes are a metric measure of the institutional details and, particularly, expressive of how majoritarian or consensual each country is along the two chosen policy dimensions. The distribution of countries along these two dimensions is graphically represented in Figure 2.4.

For instance, the U.S. is consensual in the federal-unitary dimension ("[..] strong federalism and judicial review, a rigid constitution, an independent central bank, and a bicameral parliament albeit of only medium strength") and majoritarian in the executives-parties dimension (" [...] dominant one party cabinets, a roughly two-and-a-third party system, plurality election and inter-

[33]We thank Guido Tabellini for allowing us to use this data.

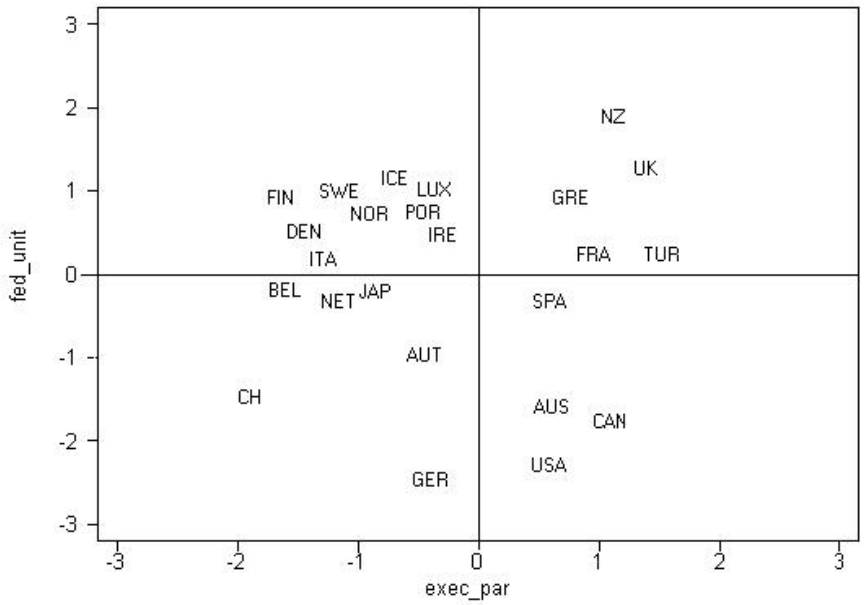

Figure 2.4: The Two-Dimensional Conceptual Map of Democracy

est group pluralism"), whereas the U.K. is very majoritarian and Switzerland very consensual in both dimensions.[34]

Finally, from the OECD statistical compendium I collected information about the countries' demographic and economic conditions. Since the different data sets span different time periods and cover different countries I found a "minimum common denominator" in the merging procedure. The final data set covers 24 OECD countries in the time period 1991-1997. In Table 2.1 I briefly define the main variables and their sources, while Table 2.2 presents the summary statistics for these variables.

Some first facts emerge. The different branches of the telecommunications industry have very different regulatory patterns. The wireline, which is an older industry with a long public monopoly history, had a higher degree of state control (**FIXREG**) than the mobile industry (**MOBREG**), which is instead a young, dynamic, and quickly developing industry.[35] The more pre-

[34]The quotations are from Lijphart (1999) p. 249.

[35]The two indexes take value 0 for high regulatory intensity and value 1 for low regulatory

cise measure of entry liberalization in the digital mobile telecommunications industry (**DIGITLIB**) indicates that, in the sample period, cellular markets were on the average duopoly markets. On average, the incumbent firm had 63% market shares (**SH_MD1**). The state's ownership share in the incumbent telecommunications operator in the mobile industry (**SH_INCMO**) was on average 57%. In the sample period and across countries the average mobile industry revenues per-year (**REV_MOB**) were equal to 10 thousand billion U.S. dollars.

In the sample, 25% of the countries had majoritarian elections (**MAJ**), but only 9% had a presidential regime (**PRES**). The other two institutional variables indicate that the average country was more consensual in the executive-party (**EXEC_PAR**) than in the federal-unitary (**FED_UNIT**) dimension.

The governments represented in the final data set were mostly coalition governments (**GOV_COAL** in 57% of the observations) with 1.97 member parties on the average (**COALSIZ**) and an average center-right wing (**RILE**) orientation.[36] The average government had 55% of the seats in the legislature (**PSEAT_G**), and were opposed by more than 4 parties (**OPP_PAR**). The two variables related to the parties' programmatic position concerning specific policy questions - pro regulation (**PRO_REG**) and favorable to welfare state limitation (**WELF_LIM**) - represent, in percent value, how often a sentence relative to a particular policy area was mentioned in the party's program.[37] So, for instance, pro-regulation statements constitute, on average, 1.77% of the government's program, whereas pro-welfare state limitation statements represent only 0.44% of the government's program.

The head of the regulatory authority had in 66% of the cases a definite office term of office (**TERM_DEF**), was in 29% of the cases appointed by the prime

intensity.

[36] See Budge et al. (2001) for a precise description of how this variable was constructed. The variable takes values in the range -50 (extreme left) and + 50 (extreme right). See Figure 2.5 for a graphical representation. For coalition governments, all the considered measures are a weighted average of the same measure for all parties in the government's coalition. The adopted weight is the percentage seats in parliament held by each party.

[37] See Budge et al. (2001) for a more precise definition and motivation. The raw data include 56 categories grouped in 7 broader policy areas.

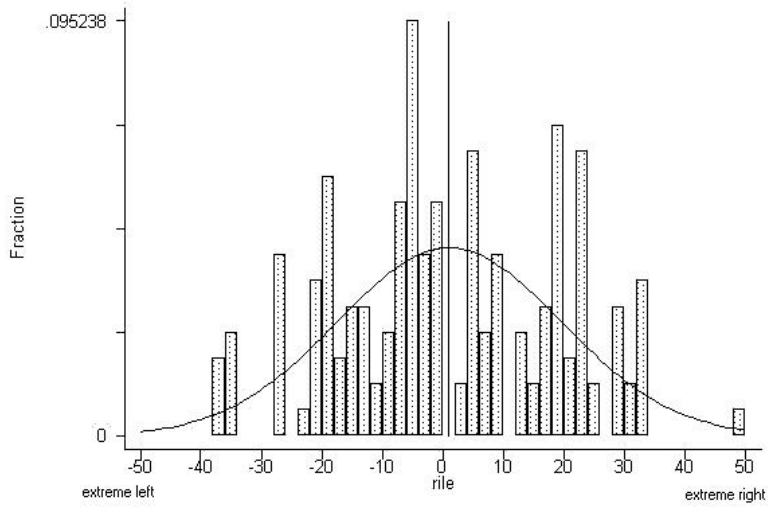

Figure 2.5: Government's Position on the Right-Left Dimension

minister (**APP_GOV**), in 17% of the cases by the president (**APP_PRES**) and in the rest of the cases by the sectorial minister. Finally, the regulatory authority was in 67% of the cases financed, at least partially, through industry fees (**FIN_IND**), had a report duty (**REP_YES**) in 75% of the cases (25% to the legislature and 50% to the minister), and in 70% of the case their decisions could not be overturned by any other political institution (**OVER_NO**).

2.5 The Empirical Methodology

The general form of the equation that I estimate is the following:

$$policy_{it} = \alpha + \beta_t + \gamma_1 \mathbf{C}_{it} + \gamma_2 \mathbf{X}_{it} + \epsilon_{it} \tag{2.1}$$

where α is a constant term, β_t is a time trend, $\mathbf{C}_{it}$ is a vector of demographic controls, and $\mathbf{X}_{it}$ is a vector of exogenous political variables. I will use different sets of exogenous variables in order to observe how much of the cross-section and time-series variation in the observed policy can be accounted for by each

of these sets.

Cross-sectional regressions

As a first step, I analyze the cross-sectional variability in regulatory intensity. For this first set of regressions I can thus use the index for the mobile telephony developed by Boylaud and Nicoletti (2000), which is a richer and more informative measure of the regulatory environment. I perform a cross-sectional regression, where I collapse all variables towards their mean value (a bar over the variables means that I took their time average):[38]

$$\overline{policy}_i = \alpha + \gamma_1 \overline{\mathbf{C}}_i + \gamma_2 \overline{\mathbf{X}}_i + \epsilon_i \tag{2.2}$$

I perform two robustness tests: the Cook-Weisberg test for heteroskedasticity and the Ramsey RESET test for omitted variables.[39] Although I have very few observation (24 countries in the sample), I will observe whether some first qualitative results emerge, which can later be compared to the findings obtained with more correct panel methods. The advantage of this approach is that it allows me to concentrate on the analysis of cross-sectional variation only.

Panel Regressions

As I already acknowledged, the database allows me to use panel methods to account for unobserved heterogeneity. This approach should lead to more accurate estimates for the effects of political-economic variables on policy outcome. Unfortunately, the indicators developed by Boylaud and Nicoletti (2000) are averaged over the sample period and, therefore, do not present time variation and cannot be used in panel regressions. I therefore use a second variable related to the degree of liberalization and of entry liberalization in the digital mobile telecommunications industry (**DIGITLIB)** as a dependent variable. This takes value 1 if the market is a monopoly, 2 if it is a duopoly, and 3 if the market is more competitive (3 or more firms).[40] This ordered variable can be

[38] This is the so called between estimator, it is not particularly efficient, since it discards all the over-time information of the data.

[39] For a description see STATA manual vol. 3 p. 97.

[40] Unfortunately, the information about the number of firms is not available in the database. The right censoring problem could therefore not be overcomed.

seen as the observable counterpart of a continuous latent variable, which can be thought of as the "intensity of entry liberalization," or as the utility derived by the policy maker by implementing one of the mentioned market structures.

One could estimate such a model as a linear regression model, denying the ordinal nature of the dependent variable, and in this way implicitly assuming that the intervals between adjacent categories are of equal length. This would imply a potential bias in the coefficients' estimates that could be very strong. The appropriate method to estimate a model with an ordinal dependent variable is the so called ordered probit model.[41] Furthermore, because of the panel nature of the sample, I estimate the ordered probit model with country random effects, where it is assumed that the error term is constituted by two components, a country specific term u_i, and a white noise error term ϵ_{it}:

$$\begin{aligned} policy^*_{it} &= \alpha + \beta_t + \gamma_1 \mathbf{C}_{it} + \gamma_2 \mathbf{X}_{it} + u_i + \epsilon_{it}, \\ policy_{it} &= \begin{cases} 1 & \tau_0 \leq policy^*_{it} < \tau_1 \\ 2 \quad \text{if} & \tau_1 \leq policy^*_{it} < \tau_2 \\ 3 & \tau_2 \leq policy^*_{it} < \tau_3 \end{cases} . \end{aligned} \tag{2.3}$$

Where $policy^*_{it}$ is the latent variable, $policy_{it}$ is the observed categorical variable, and the $\tau' s$ are the so called thresholds, which determine the length of each category and which will also be estimated.[42]

For the panel specifications, I adopt as a measure of fit the Mc Fadden's pseudo R-squared, which is defined as follows:

$$R^2_{MF} = 1 - \frac{\ln \widehat{L}\left(M_\beta\right)}{\ln \widehat{L}\left(M_\alpha\right)},$$

[41] The ordered probit model assumes that the error term is normally distributed. See Long (1997) for a very clear presentation of ordinal regression models. See also Maddala (1987) for further discussion.

[42] I used LIMDEP to estimate the ordered probit model with random effects. The identification assumption in this case is that $\tau_1 = 0$ and the model is estimated with a constant. See Limdep Users' Manual (1998).

where $\ln \widehat{L}(M_\beta)$ is the log-likelihood function for the model with regressors, while $\ln \widehat{L}(M_\alpha)$ is the log-likelihood function for the model with just the intercept.

2.6 Results

In this section, I summarize the results. The main aim of this study is to find robust stylized facts about the political economy of the regulatory process. I intentionally adopt a reduced form approach, although I recognize that it has potential pitfalls, especially concerning the interpretation of the coefficients' estimates. Nevertheless, I am confident that this analysis can contribute to the debate on the politics of regulation, because the empirical evidence is still very scarce.

2.6.1 Cross-sectional Regressions

Table 2.2 is the starting point. It reports the results of the cross-sectional regressions, where the dependent variable is the regulation intensity index in the mobile telecommunications industry (**MOBREG**) developed by Boylaud and Nicoletti (2000). Following the presentation in the previous section, I regress different sets of dependent variables separately, in order to understand how much each of those sets contributes to an explanation of the cross-sectional variability in the regulatory policy. Since the number of observations is quite small, I choose to adopt parsimonious specifications.

The first set of political variables that I consider relates to the country's political institutions. In this case, I only use the institutional dummies taken from Persson and Tabellini (1999). These political institutions' measures are highly significant and have the expected sign. In particular, the degree of deregulation is higher in countries with a majoritarian election rule (**MAJ**), while the presidential regime type implies a tougher regulatory policy (**PRES**).[43]

[43] We also run the same regression using the metric measures of institutions. Both measures are significant and, as expected, more majoritarian countries in both the executive-parties (**EXEC_PAR**) and federal-unitary (**FED_UNIT**) dimensions were better able to

Among the control variables, only population is significant. This specification had a very high explanatory power ($Adj.\ R^2 = 0.5248$), meaning that more than 50% of the variation in regulatory intensity among countries can be explained by these simple measures of their political constitution. Both the null hypotheses of homoskedasticity and no omitted variables were not rejected, which gives me confidence about the estimates' reliability.

The second set of political variables that I use is also related to institutional details, and particularly to the government type and viability. I contrast one-party (**GOV1P**) to coalition governments (**GOVCOAL**), and I further control for the cohesiveness of the coalition governments, as expressed by the number of parties in the coalition (**COALSIZ**), for the government's support in the legislature (**PSEAT_GO**), and for opposition's fractionalization (**OPP_PART**).[44] In this case, the political variables are almost not significant. The only significant term is the percentage seats in the legislature held by the government parties, which is negative. The Adjusted R-squared is much lower than in the previous specification and the F-test fails, meaning that this specification was bad.

I then test the role of the government's ideological position, using three different measures. First, I use the synthetic indicator for the government's right-left position (**RILE**). This variable, which was created by Laver and Budge (1992) and tested several times by political scientists, is a synthetic measure for the overall political position of the considered party.[45] All other things being equal, the government's position in the right-left dimension does not play a significant role in explaining regulatory intensity.[46] To better un-

implement the liberalization process in the mobile telecommunications industry. We then run the model with the four variables together, the results remain practically unchanged and the fit of the regression increases significantly ($Adj.\ R^2 = 0.6578$). In this latter case, however, the heteroskedasticity test fails. These results can be obtained from the author upon request.

[44]For identification, we suppress the **GOV1P** dummy since we estimate the model with a constant.

[45]For coalition governments, the considered measure is a weighted average of the same measure for all parties in the government's coalition. The adopted weight is the percentage seats in parliament held by each party.

[46]Note that this stays true also if we regress the regualtory intensity on the controls and

derstand how strong the ideological position concerning some specific issues is transformed in effective policy - once the parties came to power - I use two further variables, which are related to the government's attitude towards regulation (**PRO_REG**) and towards the welfare state's limitation (**WELF_LIM**). Both variables have the expected sign, but only the pro-welfare limitations position is significant at the 10% level: Governments formed by parties which were programmatically in favor of welfare state's limitations liberalized more. Sign and significance of the demographic controls are similar to the previous specifications. Also this last specification has a quite high explanatory power ($Adj.\ R^2 = 0.5058$), even though the regression seems to be badly specified since the F test fails. Both the heteroskedasticity and the Ramsey tests accept the null hypotheses.

I then regress the dependent variable on a set of variables, which should capture the private interests theory's arguments. While, on the one hand, I proxy the incumbent firms' interest by using their market share (**SH_MD1**), on the other hand I proxy potential entrants' interests by using the log of industry revenues (**log(REV_MOB)**). Finally, I use the population between 15 and 64 years (**ACTPOP**) to proxy for the consumers' interests. Only the proxy for the incumbent's interests results significant at the 1% level: a strong incumbent achieved a less liberalized environment. The variable that proxies for consumers' interests - i.e., the "active" population - has the expected positive sign, but it is not significant. The variable that proxies for the potential entrants' interests is not significant as well, but it presented the negative sign.[47] The fact that both these variables are not significant is not unexpected. For consumers, as well as for potential entrants, it is much more difficult than for an incumbent firm to organize their interests because of the well known free riding problem in lobby formation. Furthermore, potential

RILE alone. However, it should also be mentioned that the use of such a measure in the cross sectional regression may be problematic, since we averaged the position of different governments along the time dimension.

[47]Since high revenues are also in the interest of incumbent firms, one can think that the coefficient's estimate is not significant because the opposite actions of incumbents and entrants counterbalanced.

entrants might have found it more difficult to lobby effectively, since they were endowed with less resources than the incumbent firm. This specification performs extremely well, explaining more than 70% of the variability in regulatory intensity ($Adj.\ R^2 = 0.7306$). The proposed specification tests accept both the null hypotheses.

Finally, I analyze the role of regulatory institutions. I already mentioned that the measures for the regulator's independence and accountability are quite simple, nevertheless, it is worth trying to see whether these agency's characteristics influence regulatory patterns. I proxy regulator's independence by a dummy equal to one if the regulator's decision could not be overturned by any other political institutions (**OVER_NO**), and regulator's accountability by a dummy equal to one if the agency must report either to the parliament or to the sectorial minister (**REP_YES**). Surprisingly, I find a negative and statistically significant (5% significance level) relationship between the measure of regulator's independence and the intensity of regulation: a more independent regulator adopted a more restrictive regulatory policy. In contrast, regulator's accountability has a positive, though not significant, impact on regulatory intensity. This specification performs much worse than the previous ones ($Adj.\ R^2 = 0.3221$) but, as I pointed out, this can be due to the used measures of regulatory institutions rather than to theoretical reasons. In this case, in fact, both the omitted variable and the heteroskedasticity tests fail.

2.6.2 Panel Regressions

Next, I perform panel regressions, which should enable me to make more precise and accurate predictions, since they allow me to control for unobserved heterogeneity across observations. In this case, however, I cannot use the synthetic index developed by Boylaud and Nicoletti (2001) as the dependent variable, because it does not entail the temporal dimension. As I already mentioned, I use in this case **DIGITLIB** as the dependent variable, which is an ordered variable that describes the degree of market liberalization. A precise comparison with the previous results is not possible since the dependent variable is different. However, I can still compare whether the significance and

the direction of the coefficients' estimates are consistent with the previous estimations.[48] Moreover, I must keep in mind that in this case I also capture the additional variation in the dependent variable along the time dimension. For this reason, I also introduce a time index (**TIME_IND**) to account for temporal changes in the market.[49] Since the ordered regression model is non linear in the outcome probabilities, the interpretation of coefficients' size is not straightforward. Hence, I concentrate the analysis on the sign and significance of coefficients.[50]

Table 2.3 reports the results for the specifications in which I use political institutions as the explanatory variables. Among the control variables, only the time trend appear to have a significant and positive effect, which means that there was a general tendency towards liberalization during the 1990's.[51] Population has a positive but less significant impact on cellular markets' liberalization, while the income pro capita has no significant impact on the liberalization process. The positive sign of the population coefficient was expected, since in larger countries the potential users of mobile services are more, therefore a more competitive market structure is sustainable.

Turning to the variables related to political institutions, some of them are highly significant. This fact broadly confirms the previously obtained results,

[48]The two variables - **MOBREG** and **DIGITLIB** - are, in fact, strongly positive correlated (the correaltion coefficient is 0.7024).

[49]We do not estimate the model with time fixed effects because the dependent variable presents little variation in the time dimension. The use of years dummies leads, in fact, to problems in the convergence of the estimates.

[50]In order to make clear predictions on the coefficients' size, one should considered the fully standardized coefficients. In this case the effect of the independent variables on the latent dependent variable can be indicate in its original unit of measure. Predictions will then be in terms of standard deviation increases, which are anyway difficult to give a economic sense.

[51]This was expected. Starting from the 1980's, an "era of deregulation" has started in most of the industrialized countries, following the idea that state intervention cannot enhance market efficiency. Since then public utilities, and telecommunications in particular, have been widely deregulated and liberalized. Moreover, as we mentioned, the time trend should also capture the positive effect of technological change, which might have made the implementation of a more competitive market structure possible.

yet some differences emerge. The two institutional dummies have the expected sign: countries with majoritarian elections liberalized more, whereas countries with presidential regimes liberalized less. However, the presidential dummy is never significant. In the second specification, when I use the two institutional indexes alone, both of them are highly significant and have the expected negative sign: the need for consensus in both institutional dimensions made policy change more difficult. The fit of the regression, though, decreases if compared to the first specification. Finally, I propose a third specification where all the institutional measures are simultaneously used and only two of them stay significant. The majoritarian dummy and the index of consensus in the federal-unitary dimension are still highly significant and have the expected signs. Both effects are stronger if compared to the previous specifications. The presidential dummy and the executive-party dimension's index have instead the expected signs, but are not significant. In all specifications, the standard deviation of the random effects (**SIGMA**) is highly significant, which indicates that this econometric approach is appropriate, since unobserved heterogeneity among countries matters. Concerning the measure of fit, the first specification is the best and explain almost 43% of the observed cross-sectional and temporal variation in the observed policy. Yet, a direct comparison with the cross-sectional regressions is difficult because the dependent variables differ. Nevertheless, I can point out that political institutions explain much of the of the cross-sectional variation in the liberalization process, but they seem to be less able to explain its temporal variability.[52]

Table 2.4 displays the results of the specifications where I use the government's type and its viability as the independent variables. Differently to the cross-sectional regressions, I find evidence here that coalition governments have a strong and significant negative impact on the degree of entry liberalization. However, when I control for the government's support in the parliament and for the number of opposition parties, also the size of the coalition has a

[52] Also, we performed a likelihood ratio test between specifications in order to test whether the model of specification 1 and specification 2 are nested in the model of specification 3. We reject the null hypothesis that the constraints imposed to the second specification are true at the 1% significance level, while we accepted the null in the case of the first specification.

positive impact on the industry's liberalization. If, on the one hand, this result seems to support the idea that veto players may impede policy reform because coalition governments liberalized less, on the other, it is less clear why larger coalitions should have been able to liberalize more.[53] The differences observed between cross-sectional and panel regressions might suggest that the government's type is more important for explaining the variability along the time dimension, i.e. the speed of the liberalization process, than the cross-sectional differences in the degree of entry regulation. Again, the random effects' standard deviation is highly significant, supporting my empirical approach. Both specifications show that the government's type could account for about 40% of the variability in the deregulation of entry.

Table 2.5 reports the results for the regressions of the degree of liberalization on ideological variables. First, I use the simple right-left position as a regressor. It is positive and significant at the 1% level, which means that, during the sample period, right-wing governments tended to liberalize more, as expected. I then use the two variables related to the more specific positions pro-regulation and pro-welfare state limitation, which are also significant at the 1% significant level. As expected, if the government announced to be pro-regulation it liberalized less, whereas if it announced to be pro-welfare-state-limitations it liberalized more. When I use the three measures simultaneously, however, only the programmatic position pro-regulation is significant and presents the expected negative sign. Looking at the pseudo R-squared, the second specification is the one which better performs, explaining almost 46% of the variability.[54]

I then turn to the private interests theory of regulation. Table 2.6 displays the results for three different specifications. Because of the lack of information on market shares and industry's revenues, I must discard some observations.

[53] Actually, Keefer (2001) proves that the favor to special interests can decrease with the number of veto players, if governments are formed by veto players from the group of veto players, who are most harmed by favors to special interests. This could be a possible explanation for our finding.

[54] Again we perform the likelihood test in which we pair-wise compare the richest specification to the other two specifications. The first specification is nested in the third, while this is not the case for the second specification.

The first is a parsimonious specification, in which I insert one variable for each of the interests in place: the incumbent, the potential entrants, and the consumers. The results reflect the expectations, at least partially. First, the degree of entry liberalization is significantly lower when the incumbent's market share is larger. The interpretation is that the incentive to lobby and the lobbying effectiveness should increase with the incumbent's strength in the market, since its benefits from a concentrated industry structure are higher when its market share is bigger. The coefficient's estimate of the proxy for potential entrants' interests (industry revenues) is negative, but it is significant only in the first specification, while the coefficient's estimate of the proxy for consumers interests (active population) have the expected positive sign, but is not significant in any specification. Also this result was somehow expected. As I already acknowledged, both the potential entrants and the consumers face the typical free-rider problem in the creation of a lobby group, which can prevent them to effectively lobby the regulator. The measure of fit of this specification is comparable to the pseudo R-squared of the previous regressions. About 40% of policy variability is explained by the used regressors.

In the second specification, I insert a dummy equal to one if the regulatory agency is, at least partially, financed through industry fees. The coefficient's estimate for the incumbent's market share stay negative and significant. Also the new variable's coefficient is negative and highly significant. The interpretation is that a regulator that is financed by the industry may be more easily captured. Finally, I also controlled for the state's ownership share in the incumbent firm.[55] Also in this specification the estimated coefficient for the measure of the incumbent's private interests is negative and highly significant. Although these results seem to strongly support the private interest theory, one should take them cautiously. This is because to consider market structure's variables as exogenous may generate biased estimates, since the regulatory policy influences market structure. Therefore a two way causality

[55]It is worthwhile to mention that this variable can be endogenous. In fact, the telecommunications incumbent operator was privatized in the same period during which the industry was liberalized. Both processes have to be considered as part of the regulatory reform undertaken in the industry (OECD, 2000).

between determinants and effects of regulation may exists, which should be accounted for.[56]

Finally, I analyze the role of regulatory institutions. In this case I also estimate three different specifications. In Table 2.7, I report my findings. From the first specification it emerges that the adopted measures of the regulator's accountability has a positive, large, and very significant (1% level) impact on entry liberalization, while the measure for the regulator's independence is not significant.[57] When I turn to the second specification, in which I insert two dummies to control for the regulator's appointment method (equal to one if the regulator was appointed by the government or by the president respectively) I observe that these are positive and statistically very significant. While the result is difficult to interpret, it suggests that more precise measures of the regulator's independence should be developed. The regulator's appointment method, in fact, plays a crucial role in determining its independence degree. Finally, I control for a measure of the regulator's term of office. I use a dummy equal to one if the term of office is definite, which should also be a measure of regulator's independence. With a guaranteed term of office, in fact, the regulator can exercise its mandate without being subject to the possibility of being replaced by politicians responding to different interests. Interestingly, controlling for this variable increases the significance of all other measures. Moreover, both the new measure and the previously used independence's measure (**OVER_NO**) are highly significant and negative: a more independent regulator liberalized less. In all specifications, the pseudo R-squared is slightly higher than in the previous models, which suggests that the role of regulatory institutions is crucial to understand the regulatory process. Again I must acknowledge, however, that also in this case there might exist an endogeneity problem, since regulatory institutions were reformed in the same period during which the telecommunications industry was liberalized.

How can I compare the obtained results? The first comparison can be done

[56] See Chapter 3 of this thesis and Duso and Röller (2001).

[57] We divide the REP_YES dummy in two further dummies: REP_LEG=1 if the report duty is towards the legislative, and REP_MIN=1 if the report duty is towards the sectorial minister.

looking at the goodness of fit of the proposed models. I partially did this in the previous discussion. Differently than in the cross-sectional estimations, I do not observe marked differences in the pseudo R-squared among specifications. The best specifications, according to this measure of fit, are those related to political and regulatory institutions, which explain between 40% and 45% of the variability in the entry policy.

In order to perform a sort of specification test, I also estimate some mixed specifications, in which I insert the different sets of variables simultaneously, but using only those variables that have been found significant in the previous estimations. Table 2.8 displays my findings. In the first specification I use only political variables: the institutional measures, the government's type, and its ideological position are considered. The previously observed stylized facts stay true also in this richer specification at high significance levels. I then simultaneously use the variables related to the political and regulatory institutions. Qualitatively and quantitatively the results remain in this case also unchanged and parallel the findings previously observed. Also using political institutions and private interests variables together (specification 3), or regulatory institutions and private interest variables (specification 4) together, or all variables together (specification 5) does not affect the flavor of my results, even though some differences in the significance levels of the used variables can be observed.[58] Also in this case, I can stress that all sets of variables could help in disentangling policy variation.

2.7 Concluding Remarks

In this chapter I empirically analyzed the political economy of regulatory reform in the mobile telecommunications industry in 24 OECD countries during the 1990's. After giving an overview of the literature on the political economy of economic policy, I identified some theoretical predictions that I would expect to be observed in the data. This exercise had the aim of producing some ro-

[58] In particular, using political institutions and private interest variables simultaneously reduce the significance of our coefficients' estimates.

bust stylized facts, which could help in developing new theoretical tools for the analysis of the political economy of regulation. A unique data set, obtained by merging different data sources, was developed, which allows for a time-series and cross-sectional analysis of the politics of the regulatory reform.

Different strands of literature were surveyed, in order to obtain the most general view about the economic and political factors that shape economic policy. First, I asked what is the role of the state's politicalconstitution - as expressed by the electoral rule, the regime type, and by two other synthetic measures of political institutions - in shaping the regulatory policy. Second, I asked what is the role of the governments' types, concentrating on the political viability that the different governments' types may have. Third, I analyzed the role of ideology and partisanship: a synthetic measure of the government's overall right-left position, and two other measures relative to specific programmatic positions were considered. Fourth, the effects of industry's private interests were analyzed in the spirit of the Chicago School's approach to regulation. And finally, I considered some regulatory authorities' characteristics, in order to analyze whether the regulatory institutions in place also shape the liberalization process.

Concerning the empirical specifications, I adopted different econometric techniques. As a starting point I performed some cross-sectional regressions and then moved to a more accurate analysis of the liberalization process using panel techniques. Some of the observed results found a motivation in the existing theory, but I stressed the strong need for more specific and microfounded theoretical models, able to cover the different approaches taken in this study.

Some robust findings emerged out of this study. The first robust result was that political institutions also matter for the regulatory policy. In particular, countries with majoritarian elections liberalized the mobile telecommunications industry substantially more than countries with proportional elections. The regime type seems instead to have had a less pronounced impact, yet I observed a week negative relationship between liberalization and presidential regimes. Finally, the more accurate metric indexes of institutions showed that countries that were more majoritarian on the federal-unitary dimension and, to a smaller extent, on the executive-party dimension have been better able

to produce policy changes in the form of entry liberalization in the mobile telecommunications market.

The government's type was also observed to be a relatively important factor that explained the liberalization variability among countries. In particular, these findings suggested that coalition governments slowed down the liberalization process, but, surprisingly, that this effect was declining the larger the coalition. The government's ideological position played only a minor role. This can be partially explained by the fact that, during the sample period, there was a generalized tendency in the entire political spectrum to consider entry deregulation as a "good" policy. My suggestion is that ideology might have been important for explaining how fast the process was developed. The overall right-left position was not particularly significant, however I found some weak evidence that right wing governments were, as expected, more favorable to deregulation and liberalization. More interestingly, the goverments' position in favor of the state intervention in the economy was at least partially fulfilled in the realized policy: governments that claimed to be pro-regulation liberalized less.

I found strong evidence that the incumbent's private interests were reflected in the liberalization patterns. Strong incumbents were able to limit the extent of entry liberalization, protecting the rent stemming from a highly concentrated and highly profitable industry. I acknowledged however, that it would be necessary to directly assess the simultaneity between firms' market behavior and policy decision, when testing the private interest theory of regulation, in order to avoid possible endogeneity problems.

Finally, regulatory institutions played a crucial role. Regulator's accountability, in particular, was a factor that helped the liberalization of entry in the mobile telecommunications industry. The results about the role of regulator's independence were not clear cut, even though it appeared that the regulator's independence also shaped the policy decision, yet more in the direction of a less liberalized environment. However, I stressed that some more accurate measures of the regulatory institutions would be necessary to carefully analyze these important issues. In this study, I gave a first glance at the data and found some results, which cannot be fully explained by the existing theory on

the political economy of regulation. I acknowledged the need for some micro-founded models, which can more clearly predict why and how political and regulatory institutions - as well as the influence of pressure groups - matter for regulatory policy. Furthermore, it would also be interesting to have some model on how the forces which shape the regulatory process interact among each other, even though about this point I still do not have any empirical evidence. While the development of such models is a challenging theoretical issue per se, I also think that it could be very helpful for empirical analysis, since it would help in the development of clear cut empirical tests.

This work reached the, perhaps obvious, conclusion that politics also matter for this kind of industrial policy. One promising extension of our approach is the development of a political model of industrial policy, where policy determination and policy incidence are simultaneously considered (see Duso and Röller, 2001). This seems to me to be a challenging research field both for empirical and theoretical industrial economists.

2.8 Tables

Variable	Description	Source
Countries	Aus, Aut, Bel, Can, Den, Fin, Fra, Ger, Gre, Ice, Ire, Ita, Jap, Lux, Net, NZ, Nor, Por, Spa, Swe, Swi, Tur, UK, USA	
POP	Total Population in 100.000	OECD statistical
ACTPOP	Active Population aged between 15 and 64 years in 100.000	compendium
YPC	Annual Income Per Capita in 1995 constant thousand US$	
MAJOR	Dummy =1 if the country has a majoritarian election system	Persson and Tabellini (1999)
PRES	Dummy =1 if the country has a presidential regime	
EXEC_PAR	Index: consensus in the executive-party dimension	Lijphart (1999)
FED_UNIT	Index: consensus in the federal-unitary dimension	
GOV1P	Dummy =1 if one-party government	Woldendorp (1998)
GOVCOAL	Dummy =1 if coalition government	
COALSIZ	Number of parties in the coalition governments	
OPP_PAR	Number of parties in the opposition	
PSEAT_GO	Percentage seats in the legislature held by government parties	
RILE	Index: government position on the right-left dimension (higher values for right wing parties)	Budge et al. (2001)
PRO_REG	Government's programmatic position: Pro market regulations (weighted average of government's parties position)	
WELF_LIM	Government's programmatic position: Pro welfare state limitation (weighted average of government's parties position)	
FIXREG	Index: Intensity of regulation in the wireline telecommunications industry	Boylaud and Nicoletti (2001)
MOBREG	Index: Intensity of regulation in the mobile telecommunications industry	
DIGITLIB	Degree of liberalization in the digital mobile industry (1=monopoly, 2=duopoly, 3=competition)	OECD Regulation Database
SH_MD1	Market shares of the incumbent operator (1997)	
SH_INCMO	Share of incumbent operator detained by the state (1997)	
REV_MOB	Annual revenues in the mobile telecommunications industry (1995 US $)	
TERM_DEF	Dummy = 1 if regulator's term of office is definite	
APP_GOV	Dummy = 1 if regulator is appointed by the prime minister	
APP_PRES	Dummy = 1 if regulator is appointed by the president	
FIN_IND	Dummy = 1 if the regulation authority is financed by industry fees	
REP_YES	Dummy = 1 if the regulatory authority has to report either to the legislature (REP_LEG) or to the minister (REP_MIN)	
OVER_NO	Dummy = 1 if the regulator's decisions cannot be overturned by other institutions	

Table 2.1: Variables' Description

Variable	Mean	Std.Dev.	Min.	Max.	Cases
POP	483.7358	712.0181	3.8980	2667.9200	168
ACTPOP	321.9546	469.4767	2.6810	1753.5700	168
YPC	19.5914	10.8051	0.1338	43.8045	168
MAJOR	0.2500	0.4343	0.0000	1.0000	168
PRES	0.0830	0.2772	0.0000	1.0000	168
EXEC_PAR	0.2062	1.0123	-1.4700	1.8700	168
FED_UNIT	0.1075	1.1564	-1.7700	2.5300	168
GOVCOAL	0.5714	0.4964	0.0000	1.0000	168
GOV1P	0.4226	0.4955	0.0000	1.0000	168
COALSIZ	1.9702	1.1706	1.0000	5.0000	168
OPP_PAR	4.1607	2.0248	1.0000	10.0000	168
PSEAT_GO	54.8373	12.3712	13.9881	85.6152	168
RILE	1.0036	18.5006	-37.2595	48.7013	168
PRO_REG	1.7701	1.5668	0.0000	6.2500	168
WELF_LIM	0.4470	0.8881	0.0000	4.200	168
FIXREG	0.4479	0.2331	0.1742	0.8814	168
MOBREG	0.6065	0.2154	0.1590	0.9529	168
DIGITLIB	2.0476	0.8175	1.0000	3.0000	168
SH_MD1	62.9000	22.2988	0.0000	100.0000	161
SH_INCMO	56.8308	32.4556	0.0000	100.0000	91
REV_MOB	0.1E+13	0.7E+13	0.1E+08	0.9E+14	146
TERM_DEF	0.6667	0.4728	0.0000	1.0000	168
APP_GOV	0.2917	0.4559	0.0000	1.0000	168
APP_PRES	0.1667	0.3738	0.0000	1.0000	168
FIN_IND	0.6667	0.4728	0.0000	1.0000	168
REP_YES	0.7500	0.4343	0.0000	1.0000	168
REP_LEG	0.2500	0.4343	0.0000	1.0000	168
REP_MIN	0.5000	0.5015	0.0000	1.0000	168
OVER_NO	0.7083	0.4559	0.0000	1.0000	168

Table 2.2: Preliminary Statistics

	Political Institutions			Government's Type			Ideology			Private Interests			Regulatory Institutions		
	Coeff.	St. Err.		Coeff.	St. Err.		Coeff.	St. Err.		Coeff.	St. Err.		Coeff.	St. Err.	
CONSTANT	0.3854	0.1070	***	1.0265	0.3808	**	0.5932	0.1842	***	1.4310	0.3601	**	0.7702	0.1480	***
POP	0.0001	0.3e-04	***	0.6e-04	0.6e-04		0.0001	0.5e-04	**	-0.0020	0.0018		0.7e-04	0.2e-04	***
YPC	0.7e-05	0.5e-05		0.4e-05	0.5e-05		0.9e-07	0.6e-05		0.1e-05	0.3e-05	*	-0.4e-05	0.6e-05	
MAJOR	0.2274	0.0648	***												
PRES	-0.4489	0.0875	***												
GOVCOAL				-0.1673	0.2181										
COALSIZ				0.0188	0.0692										
PSEAT_GO				-0.0080	0.0045	*									
OPP_PAR				-0.0035	0.0262										
RILE							0.0011	0.0038							
PRO_REG							-0.0569	0.0538							
WELF_LIM							0.1271	0.0739	*						
SH_MD1										-0.0075	0.0020	***			
log(REV_MOBI)										-0.0183	0.0136				
ACTPOP										0.0032	0.0027				
REP_YES													0.0348	0.0589	
OVER_NO													-0.1438	0.0659	**
Obs.	24			24			24			23			20		
R-Squared	0.5248			0.3220			0.2870			0.7306			0.3526		
$Prob > F$	0.0000			0.1337			0.1918			0.0004			0.0001		
Heterosc. Test[1]	0.3543			0.6791			0.3297			0.9599			0.0598		
Ramsey Test[1]	0.9099			0.2835			0.5058			0.1660			0.0165		

The dependent variable is MOBREG. Robust Huber/White sandwich standard errors are estimated. ***, **, * represent 1%, 5%, 10% significance level, respectively. The p-value for the null hypotheses of constant variance and no omitted variables are reported.

Table 2.3: Cross-sectional Regressions - Different Specifications

	Specification 1			Specification 2			Specification 3		
	Coeff.	St.Err.		Coeff.	St.Err.		Coeff.	St.Err.	
Constant	-3.2341	0.9394	***	-0.8064	0.7230		-1.7926	1.1150	*
YPC	-0.0006	0.0341		-0.0021	0.0392		0.0012	0.0247	
POP	0.0008	0.0007		0.0019	0.0011	*	-0.0005	0.0024	
TIME_IND	1.0339	0.2237	***	0.9886	0.1791	***	1.0577	0.2731	***
MAJOR	8.5218	1.8994	***				12.1643	2.5255	***
PRES	-3.6621	4.7755					-0.4212	5.8852	
EXEC_PAR				-1.6410	0.4109	***	-0.4970	0.9035	
FED_UNIT				-0.9808	0.3836	***	-2.3829	0.9253	***
Mu(01)	4.9791	0.9188	***	4.6056	0.7763	***	4.9582	1.0905	***
Sigma	4.2509	0.8551	***	4.7398	0.7971	***	4.4729	1.3397	***
N. obs.	168			168			168		
Log likelihood	-69.8868			-74.5568			-73.6207		
Pseudo R^2	0.4213			0.3826			0.3904		
Chi-squared	146.6302			173.6584			111.5218		

The dependent variable is DIGITLIB. ***, **,* represents 1%, 5%, and 10% significance level respectively.

Table 2.4: Panel Regressions - Ordered Probit with Random Effects: Political Institutions

	Specification 1			Specification 2		
	Coeff	St.Err.		Coeff	St.Err.	
Constant	-0.6484	0.5205		-1.8984	1.2529	
YPC	-0.0007	0.0243		-0.0017	0.0266	
POP	0.0011	0.0006	*	0.0020	0.0010	*
TIME_IND	1.0499	0.2470	***	1.1527	0.3839	***
GOVCOAL	-3.2626	1.2434	***	-6.6540	2.8610	**
COALSIZ	0.3642	0.2671		1.7623	0.9235	*
PSEAT_GO				0.0112	0.0123	
OPP_PAR				0.0791	0.1319	
Mu(01)	4.8461	0.9502	***	5.5793	1.7723	**
Sigma	4.9484	1.1164	***	4.9088	1.4133	***
Obs.	168			168		
Log likelihood	-73.5973			-72.6033		
Pseudo R^2	0.3905			0.3988		
Chi-squared	168.5929			157.5847		

The dependent variable is DIGITLIB. ***, **,* represents 1%, 5%, and 10% significance level respectively.

Table 2.5: Panel Regressions - Ordered Probit with Random Effects: Governments' Types

	Specification 1			Specification 2			Specification 3		
	Coeff.	St. Err.		Coeff.	St. Err.		Coeff.	St. Err.	
CONSTANT	-0.1604	0.7566		-1.7350	1.0485	*	-0.7505	1.1732	
YPC	-0.0007	0.0231		0.0014	0.0131		0.0005	0.0069	
POP	0.0009	0.0007		0.0002	0.0008		0.0006	0.0011	
TIME_IND	1.0875	0.2337	***	1.1229	0.3704	***	1.3096	0.7203	*
RILE	0.0281	0.0121	**				0.0181	0.0168	
PRO_REG				-0.5237	0.1658	***	-0.7271	0.3032	***
WELF_LIM				1.2390	0.5131	**	1.2391	0.7905	
Mu(01)	5.3502	0.9540	***	5.3282	1.4410	***	6.3057	3.0396	**
Sigma	4.8138	0.9345	***	6.7647	1.7510	***	5.2732	2.5727	**
Obs.	168			168			168		
Log likelihood	-73.5089			-65.2567			-67.2168		
Pseudo R^2	0.3913			0.4596			0.4434		
Chi-squared	177.4725			176.9574			172.8027		

The dependent variable is DIGITLIB. ***, **,* represents 1%, 5%, and 10% significance level respectively.

Table 2.6: Panel Regressions - Ordered Probit with Random Effects: Ideology and Programmatic Positions

	Specification 1			Specification 2			Specification 3		
	Coeff.	St. Err.		Coeff.	St. Err.		Coeff.	St. Err.	
CONSTANT	14.4126	4.2054	***	12.6041	4.1404	***	12.0266	5.6756	**
YPC	-0.0007	0.0209		-0.0008	0.0482		-0.0007	0.018	
POP	0.0010	0.0026		0.0003	0.0029		0.0002	0.0065	
TIME_IND	1.1187	0.3461	***	1.1557	0.5064	**	1.1845	0.3837	***
SH_MD1	-0.1100	0.0283	***	-0.1441	0.0464	***	-0.1207	0.0384	***
log(REV_MOB)	-0.4394	0.1890		-0.2021	0.1771		-0.3156	0.2910	
ACTPOP	0.0005	0.0037		0.0006	0.0040		0.0014	0.0112	
FIN_IND				-2.1413	1.1814	***	0.9685	0.9539	
SH_INCMO							0.0011	0.0010	
Mu(01)	4.7650	1.1702	***	5.2609	1.6245	**	5.4180	1.4459	***
Sigma	4.2537	1.0094	***	4.5580	1.8092	**	4.9174	1.2013	***
Obs.	139			139			139		
Log likelihood	-61.8721			-60.2144			-59.2535		
Pseudo R^2	0.3804			0.3970			0.4066		
Chi-squared	120.6920			121.7747			122.2870		

The dependent variable is DIGITLIB. ***, **,* represents 1%, 5%, and 10% significance level respectively.

Table 2.7: Panel Regressions - Ordered Probit with Random Effects: Private Interests

	Specification 1			Specification 2			Specification 3		
	Coeff.	St. Err.		Coeff.	St. Err.				
CONSTANT	-6.9842	2.3154	***	-6.5866	3.8273	*	-15.2353	4.3514	***
YPC	-0.0029	0.0619		-0.0013	0.0488		-0.0046	0.0854	
POP	0.0026	0.0016	*	0.0016	0.0023		0.0042	0.0018	**
TIME_IND	1.0531	0.2148	***	1.0617	0.3480	***	1.0847	0.3190	***
REP_LEG	6.9991	2.2797	***	2.7693	1.7634		8.5697	3.4029	**
REP_MIN	6.6765	2.0772	***	6.8230	2.4643	***	15.2268	4.1670	***
OVER_NO	-0.2902	0.7754		-0.7240	1.6595		-4.3335	2.4022	**
APP_GOV				3.5282	1.4275	**	7.1314	3.0020	**
APP_PRES				4.7662	1.4327	***	5.8261	2.5710	**
TERM_DEF							-0.0094	0.0040	**
Mu(01)	5.0144	0.9222	***	4.9942	1.3628	***	5.0983	1.1394	***
Sigma	4.8900	1.0709	***	5.1562	1.3399	***	5.5877	1.7546	***
Obs.	168			168			168		
Log likelihood	-67.2545			-67.7132			-65.7883		
Pseudo R^2	0.4431			0.4393			0.4552		
Chi-squared	135.4026			132.2688			118.0623		

The dependent variable is DIGITLIB. ***, **,* represents 1%, 5%, and 10% significance level respectively.

Table 2.8: Panel Regressions - Ordered Probit with Random Effects: Regulatory Institutions

	Specification 1			Specification 2			Specification 3			Specification 4			Specification 5		
	Coeff.	St. Err.		Coeff.	St. Err.		Coeff.	St. Err.		Coeff.	St. Err.		Coeff.	St. Err.	
CONSTANT	-2.3781	2.4896	**	-7.9663	2.7704	**	1.3721	8.9006		9.9219	3.0983	***	0.0574	3.0678	
YPC	0.0010	0.0431		0.0002	0.0670		0.0012	0.0282		0.0047	0.0377		0.0019	0.1081	
POP	0.0009	0.0016		0.0006	0.0019		-0.0002	0.0037		-0.0038	0.0013	***	-0.0008	0.0018	
TIME_IND	1.0197	0.3925	***	1.0697	0.4698	**	1.3928	0.5363	***	1.0141	0.2049	***	1.3563	0.8379	
MAJOR	8.2210	3.3015	***	6.3542	1.4545	***	9.9587	5.9631	*				9.7727	5.2837	*
EXEC_PAR	0.7478	1.2697		-0.8625	1.5958	**	-1.4294	1.3908					3.9825	2.3065	*
GOVCOAL	0.7758	2.7076		-0.7132	1.8771	**	-4.0351	2.5766					-5.3265	4.4354	
COALSIZ	-0.1619	0.6723		0.3569	0.7386		2.4028	1.0442	**				1.6991	1.4517	
PRO_REG	-0.3967	0.21418	*	-0.4356	0.1814	**	-0.5076	0.2632	*				-0.3327	0.5093	
REP_YES				8.4714	2.5608	***				11.3703	2.5057	***	9.7426	4.9370	**
TERM_DEF				0.0038	0.0020	**				-0.0044	0.0019	**	-0.7447	0.0070	
SH_MD1							-0.1018	0.0835	*	-0.2044	0.0442	***	-0.2065	0.1246	*
FIN_IND							1.8976	3.8040		-7.7537	1.9298	***			
Mu(01)	4.3622	1.3044	***	4.8552	1.5266	***	6.6012	2.1241	***	4.6992	0.7377	**	6.2138	3.5358	*
Sigma	5.3868	1.8224	***	4.4835	1.4476	***	6.2483	2.2039	*	4.3950	1.0046	*	6.6416	3.7200	*
Obs.	168			168			161			161			161		
Log likelihood	-67.5578			-67.83496			-60.5648			-72.0225			-57.9852		
Pseudo R^2	0.4406			0.4383			0.4915			0.3953			0.5131		
Chi-squared	117.1021			84.0409			117.7337			95.3031			90.7710		

The dependent variable is DIGITLIB. ***, **,* represents 1%, 5%, and 10% significance level respectively.

Table 2.9: Panel Regressions - Ordered Probit with Random Effects: Mixed Specifications

Part II

The Political Economy of Price Regulation: The Role of the Firm

Chapter 3

Lobbying and Regulation in a Political Economy: Evidence form the U.S. Cellular Industry

> "There have been wide differences between commissions and in their legislative mandates, and changes over time in the political environment in which they operate [...], however these commissions become increasingly solicitous and protective of the interests of the companies they are supposed to regulate, resistant to change, wedded to the status quo" Kahn (1988) pg. 11 vol. 2.

3.1 Introduction

Over the last decades, economic regulation has attracted great attention among economists and policy makers, becoming one of the main issues on the political agenda. From a positive perspective, much theoretical analysis on the political economy side has been done since the seminal contribution by Stigler (1971), and following the tradition initiated by the so called "*Chicago School*" (Peltzman, 1976, Posner, 1974, Becker, 1983). This tradition assumes that the political process and the competition among differently organized interest groups drive regulatory decisions. In particular, as Stigler suggested, regulated

industries (firms) might be willing to collaborate in their own regulation, in order to create or to protect their private interests.

From the empirical point of view, though, there has been little attempt to analyze these questions in such a broad framework. The large body of existing empirical literature has focused on the effects of regulation on market outcome, putting less weight on the process which determines the observed regulatory regime. However, if firms can influence the regulatory regime under which they operate, a two way causality between the effects and the determinants of regulatory decisions has to be accounted for. Studies which neglected this simultaneity can be seriously biased in their empirical findings.

In this chapter I develop a political economy model of regulation as a first attempt to empirically study this set of questions. I shall present a reduced form simultaneous model for firms pricing behavior and price regulatory choice, which encompasses economic as well as political factors to explain the role of economic regulation. The main point I will make is methodological: the endogeneity of regulatory policy, motivated by political economy reasons, has to be explicitly considered to empirically model the impact of regulation on prices. Moreover, taking this consideration into account, I want to determine the (unbiased) impact of price regulation on cellular tariffs using U.S. data for the second half of the 1980's. Finally, I am also interested in identifying the main determinants of regulatory choice, considering variables such as the firms' lobbying activity, consumer protection, as well as other political factors.

Because of its particular structure, the U.S. cellular telephone industry provides a unique environment to analyze the issues mentioned above. On the one hand, the Federal Communication Commission (FCC) divided the U.S. into precisely defined geographical markets and regulated entry allowing only two cellular operators in each area. On the other hand, the jurisdiction over price regulation was left to the individual States, because of the service's local nature. Price regulatory decisions have been widely heterogenous across the different States, providing an exceptional "natural experiment" for studying the role of regulation on prices as well as on the determinants of regulatory choice.

There are some other contributions that have empirically analyzed the im-

pact of regulation on the price level in the U.S. cellular industry. They generally tested whether *exogenous* regulatory variables have a significant impact on prices using a reduced form approach.[1] The results they obtained are contradictory. Ruiz (1995) found that the regulatory variables did not significantly explain prices, and concluded that the analysis did not allow any policy suggestions. Shew (1994) and Hausman (1995) observed that the regulatory variables were significant and that the sign of the coefficient was positive. This finding suggests that prices rise with regulation.[2] The main explanation has been that regulation led to higher prices because it facilitated collusion. The regulatory body, in fact, could have acted as a cartel board which made firms' pricing strategies common knowledge (Porter, 1983a and 1983b). This information dispersion could have made it easier for firms to recognize if someone had chiseled, making collusion easier to sustain. Another analysis of the effects of regulation in the U.S. cellular industry is Parker and Röller (1997). They specified a structural model in order to estimate whether the duopolistic industry structure led to a competitive outcome. The main findings are that the U.S. cellular industry's conduct was anticompetitive and that multimarket contact, cross-ownership, and regulation played a role in explaining this result. All the previous empirical studies may be subject to a significant misspecification problem (Mathios and Rogers, 1989; Teske, 1991a and 1991b; and Baron, 1995). If regulated firms have some control over the regulatory regime under which they operate, then treating regulatory variables as exogenous introduces a selection bias (Heckman, 1976 and 1979). It is therefore necessary to endogenize regulatory choice, which is one of the contributions of

[1] Similar analyses, which took the same kind of approach, were performed for the wireline telecommunications industry as well. See among others Mathios and Rogers (1989), Kaestner and Kahn (1990), Tardiff and Taylor (1993), and also Kriedel, Sappington and Weisman (1996) for a survey.

[2] In fact, Hausman (1995) pointed out that "A possible objection that higher prices may lead to regulation, thus causing the regulation variable to be jointly endogenous, does not make economic sense in the cellular context. [...] Nevertheless, I estimated the model using instrumental variables". The endogeneity of regulation is, in his view, not determined by political economy reasons as I believe. The results are unaffected by the used estimation methodology.

this study.

There exists some empirical literature dealing with the endogeneity of regulatory decisions. The typical approach is to explain the discrete choice among different regulatory plans using political and economic variables.[3] The regulatory policy in the U.S. wireline telecommunications industry has been empirically analyzed, first in a static and then in a dynamic setting by Donald and Sappington (1995) and (1997) . They found evidence that both the political as well as the regulatory history were important determinants for the chosen regulatory regime. Teske (1991a) and (1991b) used a rent-seeking approach to address more clearly the issue about firms specific "political strategies" to achieve the desired regulatory environment in the U.S. wireline telecommunications market. In particular he showed that U.S. West, one of the "Baby Bells," seemed to have adopted the strategy of avoiding regulators, and aggressively influenced legislators in order to achieve the desired deregulation of the (wired-line telecommunications) markets in which it operated. Yet, all these studies, excluding partially the last one, neglected the importance of firms' strategic behavior in influencing the regulatory game, but rather focused on the role of the political and regulatory environments.

Empirically, my contribution bridges between these two different approaches, accounting for the simultaneity between firms' pricing behavior and regulatory decisions. This is not merely a question of enhancing the analysis' complexity, but rather it is an important qualitative step into the empirical modelling of the political economy of regulation. The econometric tool that is appropriate to achieve this goal is an endogenous switching regression model (Maddala and Nelson (1975); Lee (1978) and (1979)), which is a simultaneous equations model with a binary qualitative variable (regulatory status) and limited dependent variables (regulated and non-regulated tariffs).

The chapter proceeds as follows. In Section 2, I give a description of the

[3]For another modeling approach see the paper by Kroszner and Strahn (1999) on the economics and politics of banking deregulation. They contrast private interest theory vs. public interest theory of regulation and empirically test them on the relaxation of bank branching restrictions in the U.S. since the 1970's. For an analysis of the political economy of price deregulation in the wireline telecommunications industry see Kaserman et al. (1993).

market analyzing some preliminary statistics. In Section 3, I derive a theoretical framework that will be our starting point for the empirical analysis. Section 4 deals with the empirical specification and the econometric analysis. I present the main results in Section 5 and close the chapter in Section 6 with some concluding remarks.

3.2 A Description of the Market and Data

The regulatory environment in the U.S. cellular market is quite unique. The first regulatory decision, in the late 1970's, was to split entry and price regulations. Regulatory jurisdiction was assigned to different agencies: the Federal Government (Federal Communication Commission) kept the right to regulate entry through its authority to assign radio spectrum to cellular services providers. Despite the fact that the magnitude of economies of scale could have been substantial, the commission's final decision in 1981 was to allow entry of two cellular service providers in each area.[4] The first ("wireline") license was typically awarded to a regional Bell operating company (the RBOC), which was operating in the same area, and the second ("non-wireline" license) was assigned mainly to independent companies.[5] Reselling of the licences was allowed, the only prohibition being that the same operator may not own both licences in one area. The process of awarding licences took several years and some of the non-wireline licences were resold by firms who had won the lottery but were not really interested in operating in the cellular market. The long

[4]The FCC divided the country into non-overlapping markets corresponding to the 306 Standard Metropolitan and 428 Rural Statistical Areas (SMSAs and SRSAs respectively). In this paper we will only concentrate on the former, which are represented in Figure (3.1).

[5]This decision was controversial. FCC's main concern was that of the natural monopoly nature of the industry (this view was also sustained by AT&T), which would suggest to allow only one firm operating in the market. A different approach was proposed by the Antitrust Division of the Department of Justice (DOJ), which advocated the awarding of a higher number of licences (4 or 8). The concern was that, given the uncertainty about the magnitude of economy of scale, there was the risk of allowing too little entry. The main point of the Antitrust Division of the DOJ was that the market should determine the optimal number of firms which can operate efficiently.

discussion about how the licences should be awarded and the length of time it took to allocate the licenses,[6] led to delays in the introduction of cellular services which implied high cost to the U.S. economy.[7] At the beginning of the 1990's in almost all of the SMSAs two operators were able to offer their services. Regarding the concern about market competitiveness where only two firms operate, the FCC required cellular operators to offer service at wholesale prices also to "resellers". Furthermore, it imposed the prohibition of limiting the number of resellers in a market. As Shew (1994) pointed out, the positive effect of reseller competition, at least during this initial industry's phase, was limited in many markets.

Even if the entry policy of the FCC raised some doubts in relation to the effective competitiveness, which could be reached in a duopoly market, and even though there were some concerns about the fact that wireline companies had some advantages given by their head-start position, more or less half of the States decided against the use of price regulation. In only a few States have cellular tariffs been strictly regulated, whereas in others only loosely regulated, and in most States they have not been regulated at all. Some States even adopted some form of a regulatory ban, either at the legislative level or at the Public Utility Commission's (PUC) level. This can be accounted for, for instance, by a general skepticism against price regulation. The lack of information about costs was one major problem as well, a fact which would have made an assessment of proposed prices difficult. An alternative explanation, which will be the core of our analysis, is that many States adopted some form of regulatory ban, because of the lobbying activity of some firms, whose rent seeking strategy has been directed to avoid a regulated environment. Shew (1994) and Ruiz (1995) provide detailed information about the different regulatory regimes implemented in the individual States. I refer to these papers

[6] Gruber and Verboven (2001), using OECD data, stress the significant role that the timing of the licences played in explaining diffusion of cellular services: States which first granted licences seem to have a fairly long persistent lead.

[7] The cost was estimated to be about 86 billion dollars (Rohlfs et al., 1991). See also Hausman (1997) for an estimate of the welfare cost of delaying the introduction of new services in telecommunications.

for a deeper analysis. In this work, I will not concentrate on the different forms of regulation. In this first approach I want to test whether regulation, in any form, had some clear effect on firms pricing behavior compared to a non-regulation situation, and to investigate what determines the choice for a regulatory ban.[8]

The data stem from different sources and cover the time spanning December 1984 to July 1988.[9] The original data set contains information about service prices, input factor prices, demand variables, and industry structure variables. The sample contains information about 72 SMSAs. I then enlarged the original data set to encompass information about the political and regulatory environment using data from the Statistical Abstract of the United States, from the Book of the States, and information from the states' regulatory commissions. The summary statistics for the relevant variables, which are defined in Table 3.1, are presented in Table 3.2. The first column refers to the full sample, whereas the second and the third refer to the subsamples of non-regulated and regulated markets, respectively.[10]

One can observe that prices in regulated markets are, on average, slightly higher than in non-regulated markets.[11] In particular the price p_1, referring to

[8]It is worth noting that different regulatory regimes may have different effects on pricing behavior. In this paper we will not consider this issue, even though later we will briefly discuss this point.

[9]I owe particular thanks to Lars-Hendrik Röller and Phil Parker for providing me with the main data set. A description of the sources, as well as a deeper analysis of the data, can be found in their paper (Parker and Röller, 1997). Most variables have yearly frequency, although some of the prices were collected more than once per year when available.

[10]Non-regulated markets are those markets where a ban on price regulation was imposed by legislative or regulatory commission's action. The regulatory data were courteously provided by W.B. Shew (see Shew, 1994, Table 4.2). In Table 3.3, I describe the regulatory variable more in detail.

[11]The prices of a singular cellular operator are defined, as in Parker and Röller (1997), as the monthly bill paid for a given level of usage. Normally, cellular operators use nonlinear prices composed by a fixed fee, a usage fee for the "peak hours", and a usage fee for the "off-peak hours". Moreover, every operator offers different plans related to the intensity of usage (low, middle, or high usage). The prices reported represent the monthly bill calculated for different monthy usage times (5, 500, and 3000 minutes) assuming that consumers chose the least expensive plan.

"low usage" (monthly usage of 5 minutes), is on the average about 7% higher in regulated markets, whereas p_2 (monthly usage of 500 minutes) is around 2% and p_3 (monthly usage of 3000 minutes) 0.5% higher in regulated markets. However, given the high standard deviation, all price differences are not statistically significant. I do not have firm specific measures for cost, but I can relay on market specific data. One can not observe large differences among regulated and non-regulated markets, even though in the former most cost drivers take slightly higher values. Only ENERGY and PRIME are on the average higher in non-regulated markets. Significant differences can instead be observed with regard to the variable POP. In regulated markets population is on the average much higher (40%) than in non-regulated ones. Also CROSSOWN and MULTIMKT take significantly different values in the two subsamples. In particular both variables assume higher values in non-regulated markets; a fact which could suggest that in those markets collusive behavior was more probable.[12] ENTRY assumes slightly higher values in regulated markets, meaning that the incumbent's lead over the second operator was shorter (LEAD).

Turning to institutional variables, in the sample period the state's governor was principally from the Democratic Party (DEM84 and DEM88). However, between 1984 and 1988, the Republicans gained back many states. Unexpectedly, the Democrats were more present in non-regulated (81%) than in regulated markets (66%) at the beginning of the sample period, but they lost more states in the regulated subsample (from 81% to 53%) than in the non-regulated one (from 66% to 64%). Around 58% of the States were politically stable during the sample period and did not experience a gubernatorial change. Also, in this case the differences between regulated and non-regulated markets are consistent: 72% of the States that adopted regulation did not experience a change in political majority during the sample period, while only 43% in the non-regulated markets subsample.

Furthermore, I considered variables that are directly related to regula-

[12] Parker and Röller (1997), in fact, have shown that multimarket contact and crossownership were among the most important determinants of the industry's collusive conduct. Also, see Busse (2000) who, using the data by Parker and Röller, found that multimarket contacts increase prices by approximately 7-10%.

tors' characteristics. In general, one observes more appointed (APPOINT) than elected (ELECTED) regulators in both the subsamples. However, the percentage of elected regulators is lower in regulated markets than in non-regulated ones.[13] The number of full-time employees in the State PUC in 1984 (STAFF84) was much larger in States that adopted price regulation.[14] Finally, in regulated markets the size of the commission has been significantly reduced (ΔSTAFF) during the sample period, whereas it has increased in non-regulated markets. Notice, however, that the variability was much higher in the former than in the latter case.

Concluding, there are some institutional differences among regulated and non-regulated markets, even though not strongly significant, but one needs an econometric analysis to clearly answer why some markets were regulated and what were regulation's effects.

3.3 A Theoretical Framework

In this section, I will present a theoretical background on which I will base the empirical analysis, and from which I will derive some hypotheses to test. It will not be a structural but rather a reduced form model. Despite the fact that this approach lacks a rigorous micro foundation, it has the advantage of being more general and of not relying on specific functional form's assumptions.[15] One should consider this approach as a first attempt to empirically analyze the issue, which should help in understanding the economics and politics of

[13] We would have expected to observe higher values for ELECT in the regulated markets subsample, under the presumption that elected regulators should be more pro-consumer (see Besley and Coate (2000)) and therefore should regulate more often. However, as stressed by Gormley (1981), consumers' movements seem to be more active in states with appointed regulators.

[14] This can be a sign that the cost of regulation was higher in States that did not regulate. In fact, in those States, the regulatory resources seem to have been more scarce and therefore the opportunity cost to regulate a new industry might have been higher.

[15] Recently a micro-founded "common agency" framework based on Bernheim and Whinston (1986) has been developed to study the political determinants of governmental policies. A path-breaking theoretical application to trade policy is Grossman and Helpman (1994).

regulation and which could be followed by a more rigorous micro founded analysis.[16]

3.3.1 The Regulatory Choice

As a starting point, I assume that the regulatory agency uses a simple rule to determine whether a market should be regulated or not on the basis of the regulation's effect on prices. If regulation is thought to decrease prices "enough," then it is adopted. One can think of this rule as representing the optimality condition for a regulator maximizing an objective function, which is a weighted sum of total welfare and of its private interests. At the optimum, the regulator weights regulation's marginal benefits to its marginal costs. I then write a reduced form equation, which constitutes the decisional criterion for the regulator:

$$R^*_{ts} = \alpha_0 + \alpha_1 \left[\log\left(p^1_{ts}\right) - \log\left(p^0_{ts}\right)\right] + RSC_{ts}\alpha_2 + PV_{ts}\alpha_3 + RC_{ts}\alpha_4 + \epsilon_{ts}. \quad (3.1)$$

where $[\log(p^1_{ts}) - \log(p^0_{ts})]$ is the difference between non-regulated and regulated prices, RSC_{ts} is a vector of regulator's specific characteristics, PV_{ts} is a vector of political variables, and RC_{ts} is a measure for the cost of regulation.[17] One does not observe the variable R^*_{ts}, which is latent, but rather a binary variable that indicates whether a market is regulated ($R_{ts} = 1$) or not ($R_{ts} = 0$). One can thus interpret equation (3.1) as a probit model: Market s will be regulated in time t (and thus one observes $R_{ts} = 1$) if and only if $R^*_{ts} > 0$ and will not be regulated otherwise.

[16] For a first attempt of a micro-founded model for the political economy of regulation in a multiprincipal setting see Spiller (1990). A more recent model for access price regulation, based on the Bernheim's and Whinston's approach, has been developed by Trillas (2000).

[17] One can think of the problem more formally in the following way: regulate if $\frac{p^0_{ts} - p^1_{ts}}{p^0_{ts}} > r_{ts}$. On the right hand side one has the difference between non-regulated (p^0_{ts}) and regulated (p^1_{ts}) prices and, on the left hand side, a maximal price difference accepted by the regulator. This level r_{ts} can be made dependent on variables which should determine a regulator's willingness to regulate.

The coefficient α_1 plays a crucial role in the empirical analysis, since it allows me to identify the role of firms' lobbying activities vs. consumer protection. Assuming a benevolent regulator, which principally cares about consumer surplus (that is the welfare standard adopted in the U.S. antitrust policy), one would expect to observe a significant and positive value for the coefficient α_1: regulation is more probable when the benefits that it implies in terms of lower prices are larger.[18] On the other hand, one can also assume that the regulatory agency is not benevolent but rather self-interested, and that interest groups, as well as individual firms, can directly influence its decision through lobbying activity. High prices are in the firms' interest. Therefore, if firms' lobbying activities are successful, one should expect a negative coefficient α_1: the probability of regulation should be lower when regulation puts much downward pressure on prices, since lobby intensity against a regulated environment would be higher.[19] The price difference's coefficient should thus measure the relative weight that the regulator assigns to firms' lobbying and to consumers' protection. In this model I do not explicitly specify what *lobbying* is; I assume that it is any action taken by the interest group (e.g. the firm) to influence regulator's decision.[20]

The only measures for regulator specific characteristics that I could use is whether the regulator was appointed by the state's governor, or directly elected. Besley and Coate (2000) give a theoretical rationale for the importance of this issue and, in particular, they show that elected regulators should be more "pro-consumer."[21] This would mean that, whenever regulation does

[18] As long as the consumer surplus is included in the welfare function maximized by the regulator, the coefficient α_1 *cannot* be negative.

[19] One can consider the price difference as a measure for the lobbying's benefits: they are greater the less effective is regulation and, thus, the smaller the price difference.

[20] In the theoretical as well empirical literature the role of campaign contributions has been stressed as a possible mechanism, which allows pressure groups to achieve their desired policy outcome (see for instance Grossman and Helpman, 1994). In the next chapter I will also measure firms' lobbying expenditures by means of their campaign contributions. Yet, in this model I wanted to develop a procedure, which allows one to identify firms lobbying activities even when these are not observable.

[21] See also Smart (1994) for an empirical analysis of the role of regulatory body's appointment methods.

not increase prices, one should observe a positive relationship between the probability of regulation and the fact of being elected rather than appointed by politicians.

I insert the political variables as regressors in order to account for different effects. First, in many states the regulatory ban was imposed at the legislative level, therefore the governor's political orientation should account for its specific preferences in the regulatory policy. Second, the political orientation of the party in power can be seen, according to Donald and Sappington (1995) and (1997), as a measure of the political costs of choosing a regulated regime for the mobile industry. Third, one may want to control for political variables because the political environment shapes firms' rent seeking strategy, as shown by Teske (1991a) .

I also control for regulation's costs as proxied by the number of full time employees in the PUC. The main idea is that large PUCs should bare a smaller opportunity cost for setting up a regulatory regime in a new industry than smaller ones, for their resources are less scarce. The expectation is thus to observe higher probability of regulation in states with larger PUCs. Finally, I also use the change in the PUC's composition as a regressor, since it should be more difficult to capture a regulator when the PUC's composition widely varies, because of the lack of long standing relationships.

The main problem with the presented approach is that, for each observation, one observes either the regulated price or the non-regulated one, while in equation (3.1) one needs to compare both prices for each observation. In each regime I need a measure for the price which is not observed, i.e. the price that firms would have chosen if the other regime had prevailed. The adopted empirical approach shall help to overcome this problem.

3.3.2 Firms Pricing Behavior

Because prices are endogenously chosen by firms, I need to model firms' pricing behavior and determine a reduced form price equation. It is a well known result in the theory of tacit collusion in supergame that the monopoly price can be part of a tacitly collusive equilibrium outcome for certain conditions on the

discount factor (Porter, 1983a). The cellular price in market s at time t (p_{ts}) should then be a mark up (μ_{ts}) over marginal costs (MC_{ts}): $p_{ts} = MC_{ts} \cdot \mu_{ts}$. Taking the logarithm of both sides one obtains a linear relation:

$$logp_{ts} = \log MC_{ts} + \log \mu_{ts}. \tag{3.2}$$

Since one cannot directly observe marginal costs and mark-up, one needs to model them through an equation. I assume that the marginal cost is a function of cost drivers (CD) and of firms specific dummies ($firm_i$) which should capture the possible heterogeneity in firms' technology:

$$MC_{ts} = f\left(CD_{ts}, firm_{its}\right) \tag{3.3}$$

Similarly, I assume that the mark-up depends on the level of demand (Q) and on vector of market structure variables (MSV) such as multimarket contact, cross-ownership, the competitive pressure as generated by the second firm entering the market, and the status of the wireline/non-wireline pair ($Pair\_j_{ts}$), which should capture the argument that some firms' pairs achieve collusive agreements easier than others. The mark-up equation is then:

$$\mu_{ts} = g\left(Q_{ts}, MSV_{ts}, Pair\_j_{ts}\right) \tag{3.4}$$

Since demand is endogenous I specify an equation, which explains the demanded quantity:

$$Q_{ts} = q\left(p_{ts}, DD_{ts}\right), \tag{3.5}$$

where DD are demand drivers. Assuming log-linearity and substituting equations (3.3), (3.4), and (3.5) into equation (3.2), one obtains a reduced form price equation as follows:

$$\log p_{ts} = \beta_0 + \beta_1 CD_{ts} + \beta_2 DD_{ts} + \beta_3 MSV_{ts} + \beta_4 firm_{its} + \beta_5 Pair\_j_{ts} + u_{ts}, \tag{3.6}$$

where u_{ts} is an error term. I also expect regulation to have an impact on firms' pricing behavior, since different regulatory regimes should provide cellular operators with different incentives. To account for the fact that the independent

variables should have a different impact on prices, depending on which regime prevails, I specify one reduced form price equation for each regime and allow coefficients to differ in the two regimes. Furthermore, the adopted econometric model also involves the use of a correction term in the price equations, which should account for the selectivity bias that arises from the fact of being in one particular regime.

3.4 Specification and Empirical Implementation

As mentioned before, regulated firms often have influence over the regulatory regimes under which they operate. I take this issue into account in the empirical analysis by estimating a model of endogenous switching (Maddala and Nelson, 1975; Lee, 1978). This is a simultaneous equations model with a binary qualitative variable for the regulatory status and limited (censored) dependent variables: the prices. The empirical implementation of the theoretical framework analyzed in the previous Section implies thus the specification of equation (3.1), and of two price equations like (3.6), one for each of the two subsamples:

$$R^*_{ts} = \alpha_0 + \alpha_1 \left(\log p^0_{ts} - \log p^1_{ts}\right) + \alpha_2 Z_{ts} + \epsilon_{ts} \tag{3.7}$$

$$R_{ts} = 1 \qquad \text{if } R^*_{ts} > 0 \quad \text{and} \quad R_{ts} = 0 \quad \text{otherwise}$$

$$\log p^1_{ts} = \beta^1_0 + \beta^1_1 X^1_{ts} + u_{1ts} \qquad \text{if } R_{ts} = 1 \tag{3.8}$$

$$\log p^0_{ts} = \beta^0_0 + \beta^0_1 X^0_{ts} + u_{0ts} \qquad \text{if } R_{ts} = 0 \tag{3.9}$$

$$Cov\left(u_{1ts}, u_{0ts}, \epsilon_{ts}\right) = \begin{bmatrix} \sigma_1^2 & \rho_{10}\sigma_1\sigma_0 & \rho_1\sigma_1 \\ & \sigma_0^2 & \rho_0\sigma_0 \\ & & 1 \end{bmatrix}. \tag{3.10}$$

Where X_{ts}^R, $R = 0, 1$, contains cost drivers CD_{ts} (OPERATE, ENERGY, WAGE, RENT, and PRIME) demand drivers DD_{ts} (POP and BUSINESS), and a time trend (T) to control for market growth. Furthermore, I insert some variables to control for market structure (MSV_{ts}): a dummy equal to one if the second carrier has already entered market s in time t (ENTRY), variables related to cross-ownership and multimarket contact (CROSSOWN and MULTIMKT), a variable controlling for the monopolist's lead over the second entrant (LEAD), firm specific dummies (FIRM$_i$) for the major carriers, and some dummy variables to control for market structure (BELLBELL, INDBELL, and INDIND).[22] The vector Z_{ts} contains regulator specific variables RCV_{ts} (ELECT and APPOINT), political variables PV_{ts} (GOVCHANGE and DEM), as well as two proxy for the cost of regulation CR_{ts} (STAFF and ΔSTAFF). Also, I assume that the independent variables' coefficients in (3.8) and (3.9) are different, allowing complete interaction in the price equations. This assumption, which should capture the different incentives faced by firms in the different regimes, will be tested in the next Section. The error terms are assumed to be jointly normally distributed, with a variance-covariance matrix given by (3.10).[23]

As Heckman (1976) and others pointed out, there exists a selectivity bias problem that leads to inconsistent parameter estimates when estimating the price equations separately by OLS, for $E[u_{its} | R_{ts} = i] \neq 0$ $(i = 0, 1)$. To overcome this problem, one needs to correct for the endogeneity of regulation. Following Lee (1978), one can construct two selectivity bias terms as follows:

[22] According to Parker and Röller (1997), each of these dummy variables (see the Appendix for a definition) "signifies the status of the wireline-nonwireline pair." Note that I do not insert the dummy BELLIND for identification reasons, because there is a constant term in the considered price equation. BELLIND represents thus the reference market structure. I eliminate one firm dummy (CENTEL) for the same reason.

[23] The terms ρ_i $(i = 0, 1)$ represent the correlation coefficient between error terms u_{its} $(i = 0, 1)$ and ϵ_{st}. Note that $Cov(u_{its}, \epsilon_{ts}) = \rho_i \sigma_i \sigma_\epsilon = \rho_i \sigma_i$ because $\sigma_\epsilon = 1$. Note also that the correlation between the error terms of the two price equations (ρ_{12}) is not estimable since each observation comes from one regime. For references see Maddala (1987).

$$\begin{aligned} E\left[u_{1ts}\left|R_{ts}^{*}>0\right.\right] &= \rho_1\sigma_1\left[\phi\left(\alpha' z_{ts}\right)/\Phi\left(\alpha' z_{ts}\right)\right] \text{ and} \\ E\left[u_{0ts}\left|R_{ts}^{*}\leq 0\right.\right] &= \rho_0\sigma_0\left[-\phi\left(\alpha' z_{ts}\right)/\left(1-\Phi\left(\alpha' z_{ts}\right)\right)\right] \end{aligned}$$

for the regulated and non-regulated markets subsamples respectively, where $\phi(\cdot)$ and $\Phi(\cdot)$ are respectively the density and the cumulative function of a standard normal distribution.

The estimation procedure is as follows. Equation (3.7) accounts for the separation criterium and can be consistently estimated by a probit ML method. Because one does not observe both prices for each observation, in the first stage one estimates a reduced form of the probit equation obtained by substituting (3.8) and (3.9) in (3.7). Once one gets consistent estimates of the α's, the terms $\hat{\lambda}_{1ts} = \phi\left(\hat{\alpha}' z_{ts}\right)/\Phi\left(\hat{\alpha}' z_{ts}\right)$ and $\hat{\lambda}_{0ts} = -\phi\left(\hat{\alpha}' z_{ts}\right)/\left(1-\Phi\left(\hat{\alpha}' z_{ts}\right)\right)$ can be computed using the estimated instead of the real parameters' values. After inserting the selectivity bias terms as a control in the pricing schedules, one can consistently estimate the β, the ρ_i, and the σ_i terms by simultaneously estimating (3.7), (3.8) and (3.9) by FIML (Kenny et al. (1979)). The last step consists of estimating by ML the structural probit, where the estimated prices are inserted instead of the real values.

The typical test of selectivity bias is to analyze whether the coefficients of λ_{its} $(i = 0, 1)$ are significantly different from zero. But from the sign and size of the coefficient estimates one can learn even more, namely how the selectivity terms influence pricing behavior, since they represent the covariance between the error terms of the price equations and of the separation criterion. As Maddala (1987) pointed out, "[...] we ought to observe $\rho_0 - \rho_1 > 0$, but the two covariances can have any sign. It is also important to estimate the mean values of the dependent variable for the alternative choices." In my model this would mean estimating the prices in regulated markets had they not been regulated and vice versa. In this way I can determine regulation's effects on prices.

3.5 Results and Interpretation

In this section I analyze the results of the full information ML estimation of the switching regression model. I first present the results concerning the two pricing relations. In order to enrich the analysis, and to observe whether regulation had different effects on different cellular tariffs, I will propose different specifications in which I use as the dependent variable the three available price measures. In this way I will also be able to capture the different firms's strategies in different market segments.

Table 3.4 reports the coefficients' estimates for the reduced form price equation in the subsample of regulated markets, while Table 3.5 reports the results relative to the non-regulated markets.

Before analyzing in detail the coefficients' estimates for the other independent variables, I want to observe the role of the selection bias in both subsamples, since this is one of the analysis' main points. The selectivity terms' coefficients are given by the product between ρ_i and σ_i, $i = 0, 1$. In the regulated markets' subsample, both ρ_1 and σ_1 are strongly statistically significant in all specifications. In particular, the product of the two coefficients is negative, implying that the fact of being in a regulated market has put some downward pressure on cellular tariffs. Later I will precisely quantify this effect. In non-regulated markets the selectivity bias correction's coefficient is highly significant as well. Both ρ_0 and σ_0 are statistically significant in the first and third specifications, while only the variance σ_0 is significant in the second one. In this case one observes a positive coefficient's estimate for the selection terms, which means that a lack of regulation should have increased prices. The significance of these terms in both subsamples and in all specifications is the first compelling result of this analysis: the endogeneity of regulatory choice must be accounted for. The price estimate that one would obtain without correcting for selectivity bias, would in fact be inconsistent and biased. Furthermore, by applying this new methodology, I obtain a result which seems to go in the opposite direction than previously observed in the literature. Later, I shall analyze this point more in depth.

Now I turn to the description of the regression's results relative to firms'

pricing behavior. I start with the regulated markets' subsample (Table 3.4). The first interesting point is that there are evident differences in pricing behavior among low usage time tariffs on the one hand, and middle and high usage time tariffs on the other.[24] Particularly compelling is the finding that entry pressure (ENTRY) led to significantly lower usage tariffs only in the lower market segment, whereas it did not affect prices for middle and high usage times. Moreover, the only determinants of regulated prices for higher usage, apart from the selectivity bias term, are some of the demand drivers and, only partially, market structure variables. Surprisingly almost none of the cost drivers is statistically significant in all specifications. The only exception are WAGE in the second specification, which is unexpectedly negative, and RENT in the third that is, instead, positive.

Demand drivers are more significant, though coefficients' sign, size, and significance vary widely across specifications as well. The population size (POP) had a positive impact on prices which is significant only in the first specification. In all specifications one observes a positive coefficient's estimate for BUSINESS, which is significant only for the middle usage segment. As expected, the time trend (T) is negative in all specifications, since demand should expand and become more price elastic with time, but it is significant only in the middle usage and high usage specifications. The market growth generated downward pressure on prices only in the business segment, which was the fastest developing in the sample period.

Market structure variables are also partially significant in the regulated market subsample. In the middle usage segment, the head start advantage of the first license owner (LEAD) led to a small increase in cellular tariffs, whereas it did not affect low usage prices. Low usage tariffs, instead, depend significantly on multimarket contact (MULTIMKT) and on cross-ownership (CROSSOWN), but the two effects go in opposite directions. While MULTIMKT seems to have increased tariffs, as expected, cross-ownership seems to

[24] This is not surprising. The sample period corresponds to the very early phase of cellular telecommunications in the U.S.. During that period, most of the customers were business people who probably made a more extensive usage of cellular services. Firms' pricing behavior, thus, is likely to have followed different paths in the different market segments.

have decreased them.

Firm specific terms and firms-pair dummies are not significant at all in the second and third specifications. Only in the low usage segment, the market structure where a ROBOC entered a market with an independent incumbent put some downward pressure on tariffs. In regulated markets, the kind of firms pair operating in the market did not strongly influence the price level.

One possible interpretation of these findings is that regulated prices were not set by firms but rather by the regulator. This is because firms specific characteristics do not seem to have influenced regulated prices, while those variables that should explain, at least partially, consumer surplus - like demand drivers, and the selectivity bias correction to account for regulation- are the main significant cellular tariffs' determinants.

I now turn to the non-regulated markets' subsample. Also in this case, one observes some differences among the various specifications and this suggests that firms adopted different pricing strategies in the different market's segments. In the second and third specifications, prices depend very significantly on firm specific effects. Not only are the firms' dummies very significant, but also the wireline/non-wireline pairs' dummies present highly significant coefficients' estimates.[25] In particular, it seems that markets where an independent carrier owned the wireline license were more competitive, in the sense that prices were lower with respect to the reference group, which includes the BELLIND pair. While on the one hand, the presence of two baby Bells in the same non-regulated market has considerably increased prices in the middle and high usage segments, meaning that two baby Bells could have been better able to collude. On the other hand, this market structure led to more price competition in the low usage segment (BELLBELL's coefficient estimate is negative and significant). Also, it is interesting to note that multimarket contact (MULTIMKT) has a positive impact on tariffs but is significant only in the first specification.

A last minor but interesting comment may be done with regard to the entry

[25]The most of firm-specific dummies are strongly significant in all specifications (PACTEL, BELLSTH, AMERTECH, SWBELL, and MCCAW); USWEST, REST, GTE, and CONTEL are significant only in some, while only NY NEX is not significant at all.

policy. Competitive pressure imposed by the second firm entering the market did not push downwards middle and high usage time tariffs. The negative and significant impact of entry in the low usage segment could have been motivated by a more aggressive pricing strategy by entrant firms, in order to enlarge the non-business costumers base.

Before moving to the direct analysis of the price regulation's effects on tariffs, I statistically test whether coefficient estimates differ among the two subsamples using a Wald test.[26] I strongly reject the hypothesis that the same coefficients apply to the two subgroups for all specifications at any usual confidence level. This means that the explanatory variables in the two subgroups have different effects on the firms' pricing strategy, since they interact with the fact of being regulated or not: firms' behavior is influenced by price regulation.

Previous studies suggested that regulation should have increased cellular tariffs, since the regulatory dummies had a positive impact on prices. To asses more directly the regulation's impact on cellular tariffs in my framework, I ask which the prices in regulated markets would have been, had these markets not been regulated. One must then determine $E[\log p_{ts}^{NR} | R_{ts} = 1] = \beta^{0\prime} x_{ts}^{1} + \rho_0 \sigma_0 \left[\phi\left(\alpha' z_{ts}\right) / \Phi\left(\alpha' z_{ts}\right)\right]$.

I use the consistent estimates of β^i, ρ_i, and σ_i, $i = 0, 1$, and calculate the predicted regulated and non-regulated prices for the regulated markets' subsample. Table 3.6 reports the summary statistics for the predicted prices in regulated markets ($\hat{p}^1$), in regulated markets had they not been regulated ($\hat{p}^{1,0}$), and for the difference between the two. The predicted regulated prices are on average lower than the predicted non-regulated prices in every specification. This would mean that (on average) regulation has decreased prices by 14%, 10%, and 14% ca. for low, middle, and high usage tariffs, respectively. This would reverse the results obtained with dummy variables models. However, the standard deviation of the difference between the two prices is very large. Hence, to reach a more precise conclusion, I test the null hypothesis $\hat{p}^1 = \hat{p}^{1,0}$. I reject the null hypothesis at any usual confidence level for any of the used

[26] I compute the statistic $W = \left(\hat{\beta}^0 - \hat{\beta}^1\right)' \left[Var\left(\hat{\beta}^0\right) + Var\left(\hat{\beta}^1\right)\right]^{-1} \left(\hat{\beta}^0 - \hat{\beta}^1\right)$ which is distributed as a chi-squared with J degrees of freedom, where J is the number of restrictions we are testing. See Green (1993).

price measures.[27]

This finding would then mean that regulation, where it was applied, did not have very evident effects on reducing prices: in some markets it was effective, in other not. Yet, our main simplifying assumption is to consider regulation as a single entity. This is indeed not the case. As I already mentioned regulatory plans vary widely across States. There is then some heterogeneity in regulatory decisions that is not encompassed in my approach and that could be an important element to explain the observed result that effective regulation did not have a strong impact on prices.[28]

I do the same exercise for non-regulated markets and ask what the prices in these markets would have been, had they been regulated ($\hat{p}^{0,1}$).[29] In Table 3.7 I report the results. Predicted prices in non-regulated markets, had regulation occurred, would have been lower than predicted non-regulated prices in all specifications (8.5%, 3%, and 8% for low, middle, and high usage tariffs, respectively). I again perform a simple test of the null hypothesis $\hat{p}^{0,1} = \hat{p}^{0}$. Now I cannot reject the null hypothesis at the 10% confidence level for middle and high usage tariffs, but I reject it for low usage ones. This means that regulation would have significantly decreased prices for those customers who made extensive use of cellular services in non-regulated markets. The second line of Figure 3.2, 3.3, and 3.4 represents the sample distribution for the price difference in the non-regulated markets' subsample. The positive effects, which regulation would have had, are clearly evident in the middle and high usage tariffs case. There is almost no observation above the zero line: in almost all markets these prices would have fallen.

Summarizing, one the one hand regulation was not very effective in reducing cellular tariffs in regulated markets, probably also because of the heterogene-

[27] In the first line of Figures 3.2, 3.3, and 3.4 I plotted the sample distribution of the price differences in the different subsamples.

[28] A possible extension of this model, which would take this issue into account, would be the use of a nested logit approach to explain regulatory choice, instead of the simple probit analysis as I did. This would allow to consider that, once the regulator has chosen to regulate, it must also choose which kind of regulation to apply. In this way one would be able to account for the different regulatory choices that the authority has to take.

[29] I calculate $E[p^1_{ts} \,|R_{ts} = 0] = \widehat{\beta}^{1\prime} x^0_{ts} + \widehat{\rho}_1 \widehat{\sigma}_1 \left[-\phi\left(\widehat{\alpha}' z_{ts}\right) / \left(1 - \Phi\left(\widehat{\alpha}' z_{ts}\right)\right)\right]$.

ity of the regulatory schemes that we encompass under the label "regulated markets." Instead, it seems that cellular tariffs would have fallen significantly, even if not substantially, if regulation had been adopted in non-regulated markets, especially for the business sector segment. Where the wrong markets regulated?

To answer this question I estimate the structural probit by ML, where I use as regressors the difference between predicted non-regulated and regulated prices as well as other political and regulatory variables, as we derived in the previous Section. I use the three estimated price differences simultaneously as regressor to account for different firms' lobbying intensity in different market segments. The coefficient of the difference between the non-regulated and regulated prices should help one to disentangle two effects: firms lobbying activity, which would imply a negative coefficient, and consumers' protection, which would instead imply a positive coefficient's estimate.

In Table 3.8, I present different specifications depending on the adopted set of control variables. First, I use the exogenous variables alone. I then propose a specification which controls for firms' fixed effects and one which controls for regional effects in order to capture, at least partially, possible market unobserved heterogeneity.[30] I then insert some interaction terms between the price differences and the other exogenous variables, in order to control for the interaction between firms, politicians, and the regulatory agency.[31] Finally, I try a richer specification where all control variables are used at once.

The main interest here is in the sign and significance of the price difference variables. In all specifications the three price differences are strongly significant. This is a second compelling result of this study. However, both consumer protection and firms' lobbying activity seem to have played a role in the regulatory regime's choice. The first and third price differences' parameter

[30] I could not exploit the panel component of part of the data set since one of the dependent variables, the regulatory dummy, did not vary along the time dimension during the sample period. The probit regression is thus run on a cross section.

[31] The variables that I use are the following: $\log \frac{pi^0_{ts}}{pi^1_{ts}} *$DEM84, $\log \frac{pi^0_{ts}}{pi^1_{ts}} *$GOVSTAB, $\log \frac{pi^0_{ts}}{pi^1_{ts}} *$ELECT, $\log \frac{pi^0_{ts}}{pi^1_{ts}} *$STAFF84, $\log \frac{pi^0_{ts}}{pi^1_{ts}} * \Delta$STAFF where $i = 1, 2, 3$. Precise results about these variables can be obtained from the author upon request.

estimates have, in fact, a negative sign, while the second has a positive sign.

This first set of results would suggest that firms concentrated their rent seeking strategies in those markets where regulation would have hurt more, i.e. those markets where most of the customers were long-time cellular service users, and where competition was expected to be tougher because of the low demand for low usage time. These findings are also consistent with the fact that the regulator might have concentrated its action in those markets where final consumers, and not intermediate customers such as business people, were more important, since the positive sign on the middle usage prices difference. One cannot say much concerning the magnitude of the coefficients' estimates, which represent the marginal effect with respect to the overall means of the data set. The sign of the coefficient determines the direction of the effect and the effect tends to be larger, the larger is the coefficient. In the last two specifications, however, one should bare in mind that the overall price difference's effect should account also for the marginal effects obtained through the interaction terms.

Turning to the other explanatory variables, almost each is highly significant in every specification. If the State governor in 1984 came from the Democratic Party, the probability to observe price regulation was lower. This result is unexpected, given that the Democratic Party is supposed to pursue a more consumer-oriented policy.[32] Also, the probability of regulation was higher in States that did not experience a political change during the sample period. This fact might reflect the idea that States in which political changes occurred were more open toward an innovative regulatory policy, such as full price liberalization. The results concerning the political environment are quite robust: both sign and significance level do not vary much across the different specifications. Only the direct effect of government stability disappears in the best specification, though the interaction terms between GOVSTAB and the price differences are all very significant in that specification.

Also, the regulator specific characteristics and regulation's costs had significant impact on regulatory choice, but these results are less robust. Looking at

[32]This view is also expressed in Posner (1970) where Democratic amministrations are assumed to be "pro-consumer" while Republican ones to be "pro-business."

the first column one observes that elected regulators increased the probability of regulation compared to the reference group containing APPOINT, even if not significantly. However, inserting firm dummies, this variable turns also out to be significant. These findings would then be in line with those by Besley and Coate (2000): elected regulators are supposed to be more pro-consumer, and therefore should more often regulate, under the assumption that regulation reduces prices. However, the effect of elected regulators on regulatory choice is not very significant.[33] The variable STAFF, which should proxy for regulation's costs, presents the expected positive and significant sign in the first, third and last specifications. A regulator with higher resources (larger PUCs) was expected to regulate more often, for its opportunity cost of regulating a new market should be lower. This effect is anyway quantitatively very small. Also, the negative and significant sign of ΔSTAFF means that the larger were the changes in the commission's composition the lower was the probability of regulation. A possible explanation for this fact is that large changes in the commission's personnel could have make less easy to capture the regulator, because of the lacking of long standing relationships.

Furthermore, it is worth stressing the role of the different specifications. First, the introduction of the interaction terms, which should more precisely capture the "political game" among firms, politicians, and regulator has a very significant impact on our results.[34] Not only are almost all these terms highly significant and the overall fit of the model greatly improves once one accounts for them, but also some qualitatively new results appear. I believe that this is an important issue, which calls for a more precise model of these interactions.

The introduction of firm-specific terms has an important impact as well. Almost all firm-specific dummies are highly significant in the third and last specifications.[35] This finding reinforces the belief that lobbying for regulation

[33]This is also in line with the results by Teske (1991a) and (1991b) and Donald and Sappington (1995) and (1997), who did not find the regulator's appointed method to significally impact regulatory decisions. On this issue see also Smart (1994).

[34]Spiller (1990) presents a multiple-pricipals theoretical model of the interactions among politicians, interest groups and regulators, as well as some empirical evidence.

[35]USWEST and SWBELL are not significant in the second specification, while only USWEST is not significant in the last one.

by individual firms matters. Finally, also regional variables are partially significant. This would suggest the need of a more precise econometric analysis, since these dummies should, at least partially, capture some market unobserved heterogeneity that seems to matter.

The last specification, which is also the richest one, predicts the right outcome for the 92.21% of the cases that makes me quite confident about the exactness of the adopted model.

3.6 Conclusions

This Chapter investigates the political economy of regulation bridging two different approaches of the empirical literature on regulation, and empirically analyzing the simultaneity between the price regulatory choice and firms' pricing behavior. I used data from the U.S. mobile telecommunications industry because of its unique regulatory environment. The industry under consideration is quite homogenous for product characteristics, firms' technology and demand, but heterogenous for the adopted price regulation. Some States adopted strict price regulation, some loose price regulation, and others even banned price regulation. The study had different aims. First, I wanted to prove that the endogeneity of regulation is an important issue to account for because firms *do* influence the choice of the regime under which they operate. Second, I wanted to determine the impact of price regulation on cellular tariffs, after correcting for the simultaneity bias. Finally, I wanted to identify the main determinants of the choice of a regulatory regime. The econometric method I adopted consists of the estimation of a endogenous switching regression model (Maddala and Nelson (1975), Lee (1978)). To enrich the analysis I considered three measures for cellular prices, corresponding to different usage times, which allowed us to take into account different firms' strategies in the various market's segments.

We provided evidence that the selectivity bias problem, i.e. the endogeneity of regulation, is an important issue to account for. Controlling for the simultaneity problem, I have shown that prices in regulated markets were, on average, lower than the prices firms would have set, had these markets not been

regulated. But the impact of regulation is not observed to be statistically significant: price regulation, where applied, has not been very effective. On the other hand, however, I observed that prices in non-regulated markets would have significantly fallen, if regulation would have been adopted. My approach enabled the explanation this unexpected result through the explicit modeling of the regulatory policy. After controlling for other factors such as the political environment, regulator specific characteristics, and the regulation's cost, I provided some robust evidence that firms' lobbying activity against a regulated environment was successful. Also, I provided evidence that regulator's characteristics, political variables, as well as the interactions between firms, politicians, and regulators have very high explanatory power for the regulatory choice. Elected regulators, ceteris paribus, enhanced the probability of regulation more than appointed ones. Furthermore, States where the governor came from the Republican Party, whose government was politically stable in the sample period, and where regulation's opportunity cost have been lower were more favorable to some kinds of price regulation. Finally, the more pronounced the changes in the public utility commission's composition, the lower the probability of regulation, all other things being equal.

I can then conclude that my empirical approach, which allows the explicit modelling of the political economy of regulation, leads to new results in comparison to those already observed in both streams of the related literature. I do provide some evidence that price regulation, per se, did not worked in the wrong direction, increasing cellular tariffs. Effective regulation, though, did not have a significant impact, because of the firms's lobbying activity to avoid a regulated environment.

Some major caveats apply to this study. First, I limited the analysis to the dichotomous regulatory choice, not considering that different kinds of price regulation were actually adopted, that could have had very different impacts on prices. In particular, this consideration might help to understand more clearly which kinds of regulatory schemes did not work. Second, regulatory decisions are not only related to the simple choice whether to regulate a market or not; the regulatory commissions, in fact, must also decide on many other issues, which are likely to have an influence on the choice of whether to regulate or not.

These issues could therefore be simultaneously studied in a more general model of regulation, but in this case new data and a different econometric modeling approach would be necessary. Finally, in this study I adopted a reduced form approach to the political economy of regulation as well as to firms' strategic behavior, whereas both issues could be approached in a more structural way. In particular, one should try to provide a rigorous micro foundation for the interaction among regulatory commissions, legislators, and interest groups. Hence, the reported results have to be considered as the first step into a deeper understanding of the political economy of price regulation.

3.7 Tables and Figures

Variables	Definition	Source
p_1, p_2, p_3	Monthly bill calculated for different monthly usage times (5, 500, 3000 minutes)	Parker-Röller [1997]
ENERGY	Average monthly cost per square foot ($ per kilowatt hour)	
PRIME (lagged)	One period lagged prime lending rate	
RENT	Average monthly rent per square foot of office space	
WAGE	Average weekly salary per employee for the cellular industry	
OPERATE	Average monthly general overhead and operating expenses per square foot	
POP	Market Population in millions	
BUSINESS	Number of high potential business establishments (divided by 100)	
T	Time trend in months	
ENTRY	Dummy=1 after the second carrier enters into the market	
CROSSOWN	Dummy=1 when the two competitors in one market are partner in any other market	
MULTIMKT	Total number of markets where the two competitors face each other	
LEAD	Length of the monopoly period in months	
BELLBELL	Dummy=1 if both wireline and nonwireline competitors are RBOCs	
BELLIND	Dummy=1 if the wireline is a BELL and the non-wireline is an independent carrier	
INDBELL	Dummy=1 if wireline is an independent carrier and the non-wireline is a BELL	
INDIND	Dummy=1 if both wireline and nonwireline competitors are an independent firm	
Firm Dummies	Us West Cellular, Bell South Mobility, Ameritech Mobile, Nynex Mobile, South West Bell Mobile,Gte Mobilenet, Contel Cellular, Mccaw, Century Cellular, Rest	
REG	Dummy=1 if no regulatory ban was imposed in the market	Shew [1994]
DEM84, DEM88	Dummy=1 if the State's Governor was from the democratic party in 1984 and 1988 respectively	US Statistical abstract
REP84, REP88	Dummy=1 if the State's Governor was from the republican party in 1984 and 1988 respectively	
GOVSTAB	Dummy=1 if in both elections in the sample period the Governor came from the same party	
ELECT	Dummy=1 if the regulator was elected	The Book of States
APPOINT	Dummy=1 if the regulator was appointed by politicians	
STAFF	Number of full-time employees in the State Public Utility Commission in 1984	
ΔSTAFF	Change in the number of full-time employees in the State Public Utility Commission (86-84)	

Table 3.1: Variables' Definition

Variables	Full sample		Sub-sample Regulation		Sub-sample No Regulation	
	Mean	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**
p_1	17.223	10.600	16.908	11.927	17.543	9.061
p_2	196.126	39.418	197.787	40.596	194.434	38.182
p_3	1025.402	233.428	1029.426	220.473	1021.304	246.274
ENERGY	1.778	0.438	1.783	0.528	1.773	0.322
PRIME (lagged)	9.518	1.069	9.456	1.087	9.582	1.050
RENT	16.062	5.032	16.901	6.252	15.206	3.153
WAGE	519.598	119.172	521.617	101.292	517.534	135.197
OPERATE	6.724	1.724	6.825	2.181	6.622	1.072
POP	0.193	0.278	0.225	0.365	0.161	0.135
BUSINESS	2253.494	406.391	2227.075	457.181	2280.407	345.901
T	21.463	11.842	21.763	11.925	21.158	11.771
ENTRY	0.727	0.446	0.783	0.413	0.670	0.471
CROSSOWN	0.341	0.475	0.239	0.427	0.446	0.498
MULTIMKT	3.571	2.805	2.960	1.809	4.195	3.437
LEAD	10.696	8.047	9.798	7.310	11.611	8.653
REG	0.505	0.500	1.000	0.000	0.000	0.000
DEM84	0.733	0.443	0.658	0.475	0.809	0.394
DEM88	0.583	0.494	0.636	0.482	0.528	0.500
REP84	0.267	0.443	0.342	0.475	0.191	0.394
REP88	0.417	0.494	0.363	0.482	0.472	0.500
GOVSTAB	0.579	0.494	0.721	0.450	0.434	0.497
ELECT	0.200	0.401	0.154	0.362	0.247	0.432
APPOINT	0.800	0.401	0.846	0.362	0.753	0.432
STAFF	271.308	227.115	322.320	268.281	219.341	160.085
ΔSTAFF	-27.410	161.857	-73.092	212.731	19.127	50.729
Obs.	539		272		267	

Table 3.2: Summary Statistics

Regulatory Status	States
Regulatory Ban	AL, CO, DE, FL, GA, IA, IL, KS, MI, MN, MO, MT, NE, NJ, OR, PA,TN, TX,WA, WI
Tariff Regulation	AZ, CA, CT, HI, IN, KY, LA, MA, MS, NV, NM, NY, OH, OK, RI, SC, VA
Not in the Sample	AK, ID, ME, ND, SD, VT, WV, WY

Table 3.3: Regulatory Status by State

Dep. Variable	**Low Usage Tariff (lnp_1)**			**Middle Usage Tariff (lnp_2)**			**High Usage Tariff (lnp_3)**		
	Coeff.		**S.E.**	**Coeff.**		**S.E.**	**Coeff.**		**S.E.**
CONSTANT	2.700	***	1.017	5.192	***	0.435	6.665	***	.418
OPERATE	0.64E-01		0.41E-01	0.17E-01		0.23E-01	0.16E-01		0.23E-01
ENERGY	-0.110		0.198	-0.65E-01		0.51E-01	-0.80E-01		0.56E-01
WAGE	0.18E-03		0.97E-03	-0.57E-03	**	0.25E-03	-0.22E-03		0.27E-03
RENT	-0.75E-03		0.14E-01	0.86E-02		0.58E-02	0.13E-01	**	0.59E-02
PRIME (lagged)	-0.76E-01		0.58E-01	0.58E-02		0.21E-01	0.17E-01		0.22E-01
POP	0.278		0.201	0.139	*	0.82E-01	0.72E-01		0.90E-01
BUSINESS	0.99E-04		0.13E-03	0.10E-03	***	0.37E-04	0.36E-04		0.34E-04
T	-0.951E-04		0.53E-02	-0.55E-02	***	0.18E-02	-0.46E-02	**	0.21E-02
CROSSOWN	-0.464	**	0.205	-0.43E-01		0.73E-01	0.40E-01		0.85E-01
MULTIMKT	0.74E-01	*	0.43E-01	-0.18E-01		0.20E-01	-0.21E-01		0.21E-01
LEAD	0.78E-02		0.81E-02	0.55E-02	*	0.28E-02	0.41E-02		0.28E-02
ENTRY	-0.476	***	0.167	0.28E-01		0.65E-01	0.35E-01		0.69E-01
BELLBELL	-0.685		0.648	0.136		0.174	0.187		0.162
INDBELL	-1.478	***	0.370	-0.24E-02		0.111	-0.163		0.137
INDIND	0.13E-01		0.558	-0.19E-01		0.153	-0.97E-01		0.138
Firms dummies		*(3/9)			(0/9)			*(1/9)	
σ_1	0.620	***	0.31E-01	0.142	***	0.11E-01	0.220	***	0.14E-01
ρ_1	-0.949	***	0.41E-01	-0.641	***	0.147	-0.932	***	0.50E-01
Adj. R^2	0.7913			0.5551			0.5960		
Obs.	272			272			272		

***,** ,* represent significance at the 1%, 5%, 10% levels respectively

Table 3.4: FIML Estimates: Price Equation - Regulated Markets

Dep. Variable	**Low Usage Tariff (lnp_1)**			**Middle Usage Tariff (lnp_2)**			**High Usage Tariff (lnp_3)**		
	Coeff.		**St.Err.**	**Coeff.**		**St.Err.**	**Coeff.**		**St.Err.**
CONSTANT	4.071	***	1.256	4.831	***	0.278	6.545	***	0.407
OPERATE	-0.89E-01		0.75E-01	-0.14E-01		0.17E-01	-0.20E-02		0.26E-01
ENERGY	-0.80E-01		0.226	0.30E-01		0.53E-01	0.33E-01		0.75E-01
WAGE	0.99E-04		0.18E-03	0.10E-04		0.12E-03	-0.27E-04		0.18E-03
RENT	0.12E-01		0.23E-01	0.17E-02		0.61E-02	-0.22E-02		0.90E-02
PRIME (lagged)	-0.34E-01		0.78E-01	0.52E-01	***	0.18E-01	0.49E-01	*	0.28E-01
POP	0.502		0.583	0.263	*	0.152	0.173		0.215
BUSINESS	0.20E-03		0.23E-03	0.37E-04		0.46E-04	0.45E-04		0.76E-04
T	-0.72E-02		0.78E-02	0.23E-02		0.17E-02	0.35E-02		0.26E-02
CROSSOWN	0.28E-03		0.202	-0.14E-02		0.47E-01	-0.102		0.69E-01
MULTIMKT	0.97E-01	**	0.45E-01	0.12E-01		0.84E-02	0.20E-01		0.14E-01
LEAD	-0.95E-02		0.10E-01	-0.29E-03		0.22E-02	-0.83E-03		0.36E-02
ENTRY	-0.392	**	0.178	0.11E-01		0.48E-01	0.103		0.69E-01
BELLBELL	-0.793	**	0.346	0.375	***	0.83E-01	0.235	**	0.114
INDBELL	-0.73E-01		0.392	-0.128	*	0.87E-01	-0.344	**	0.136
INDIND	0.418		0.365	-0.179	***	0.72E-01	-0.319	***	0.113
Firms dummies		* (3/9)			*** (6/9)			*** (7/9)	
σ_0	0.467	***	0.30E-01	0.148	***	0.11E-01	0.155	***	0.17E-01
ρ_0	0.835	***	0.65E-01	0.245		0.485	0.445		0.372
Adj. R^2	0.46127			0.6060			0.6172		
Obs.	267			267			267		

***,** ,* represent significance at the 1%, 5%, 10% levels respectively

Table 3.5: FIML Estimates: Price Equation - Non-Regulated Markets

	Low Usage Tariff	Middle Usage Tariff	High Usage Tariff
$\hat{p}^1$	16.364	196.030	1020.101
	(11.647)	(33.346)	(179.141)
$\hat{p}^{1,0}$	19.022	217.621	1188.160
	(10.658)	(69.706)	(407.524)
$\hat{p}^{1,0} - \hat{p}^1$	2.659	21.5909	168.059
	(17.691)	(66.651)	(404.421)

Standard errors in parenthesis

Table 3.6: Predicted Prices With and Without Regulation - Regulated Markets

	Low Usage Tariff	Middle Usage Tariff	High Usage Tariff
$\hat{p}^0$	21.269	200.979	1086.774
	(10.439)	(34.747)	(205.602)
$\hat{p}^{0,1}$	19.456	194.976	997.696
	(8.761)	(34.202)	(185.043)
$\hat{p}^{0,1} - \hat{p}^0$	-1.813	-6.002*	-89.078*
	(4.862)	(4.276)	(55.988)

Standard errors in parenthesis;* represents significance at the 10% level

Table 3.7: Predicted Prices With and Without Regulation - Non-Regulated Markets

Variables	Coeff.		S.E.	Coeff.		S.E.	Coeff.		S.E.	Coeff.		S.E.	Coeff.		S.E.
CONSTANT	-0.356	***	0.164	1.227	***	0.289	-0.400	***	0.280	1.989	***	0.531	5.152	***	1.959
$\log \frac{p1^0_{ts}}{p1^1_{ts}}$	-0.350	***	0.74E-01	-0.250	***	0.80E-01	-0.846	***	0.158	-10.417	***	1.997	-31.501	***	6.1275
$\log \frac{p2^0_{ts}}{p2^1_{ts}}$	3.310	***	0.968	3.337	***	1.014	2.874	***	1.485	157.515	***	30.805	652.4819	***	111.155
$\log \frac{p3^0_{ts}}{p3^1_{ts}}$	-2.939	***	0.764	-4.472	***	0.859	-4.546	***	1.139	-113.807	***	22.865	-447.452	***	75.9895
DEM84	-0.290	***	0.130	-0.821	***	0.154	-0.489	***	0.150	-0.305		0.298	-8.418	***	1.491
GOVSTAB	0.492	***	0.146	0.461	***	0.164	0.894	***	0.196	-1.491	***	0.451	-0.945		1.145
ELECT	0.81E-01		0.179	-0.198		0.200	0.656	***	0.223	-1.237	*	0.686	-0.322		1.069
STAFF84	0.15E-02	***	0.32E-03	0.42E-03		0.35E-03	0.23E-02	***	0.44E-03	-0.86E-03		0.62E-03	0.64E-02	**	0.28E-02
ΔSTAFF	-0.20E-02		0.13E-02	-0.76E-02	***	0.15E-02	-0.36E-02	***	0.16E-02	0.76E-03		0.35E-02	-0.34E-01	***	0.12E-01
Regional Effects				YES	***								YES	***	
Firm Fixed Effects							YES	***					YES	***	
Interaction Terms										YES	***		YES	***	
Log likelihood	-320.2546			-286.6652			-257.6257			-183.3153			-52.4511		
Chi squared	102.5729			169.7516			227.8306			376.4513			638.1797		
Obs.	537			537			537			537			537		
Correct Predictions	68.16%			70.20%			72.81%			80.63%			97.21%		

The dependent variable is R_{ts} (dummy=1 if no regualtory ban was imposed in the market). Coefficients' estimates represent the marginal effect with respect to the overall means of the data set. ***, **, and * represent significance at the 1%, 5%, and 10% level respectively

Table 3.8: ML Estimates of the Structural Probit: The Probability of Regualtion

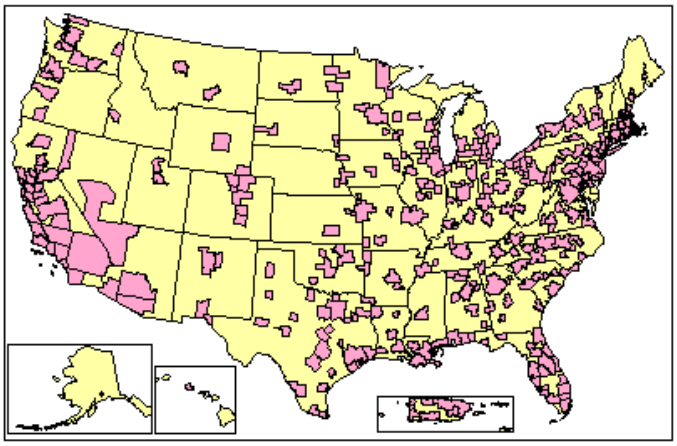

Figure 3.1: The Metropolitan Areas

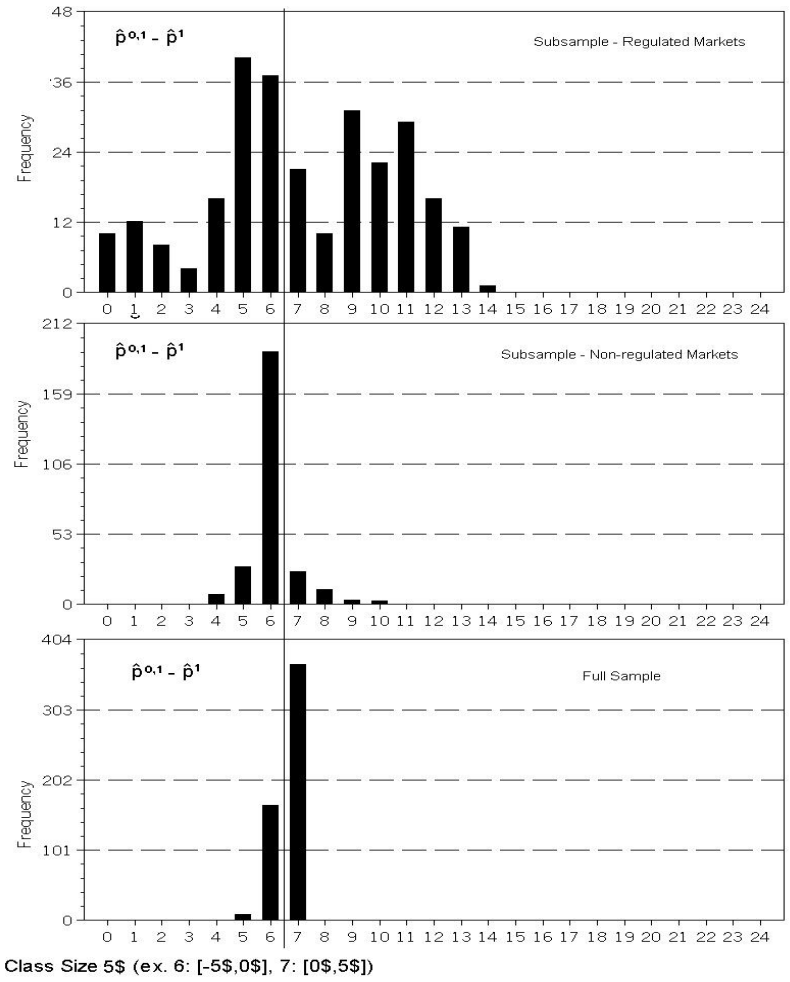

Figure 3.2: Sample Distribution of the Difference Between Non-Regulated and Regulated Prices: Low Usage Tariff

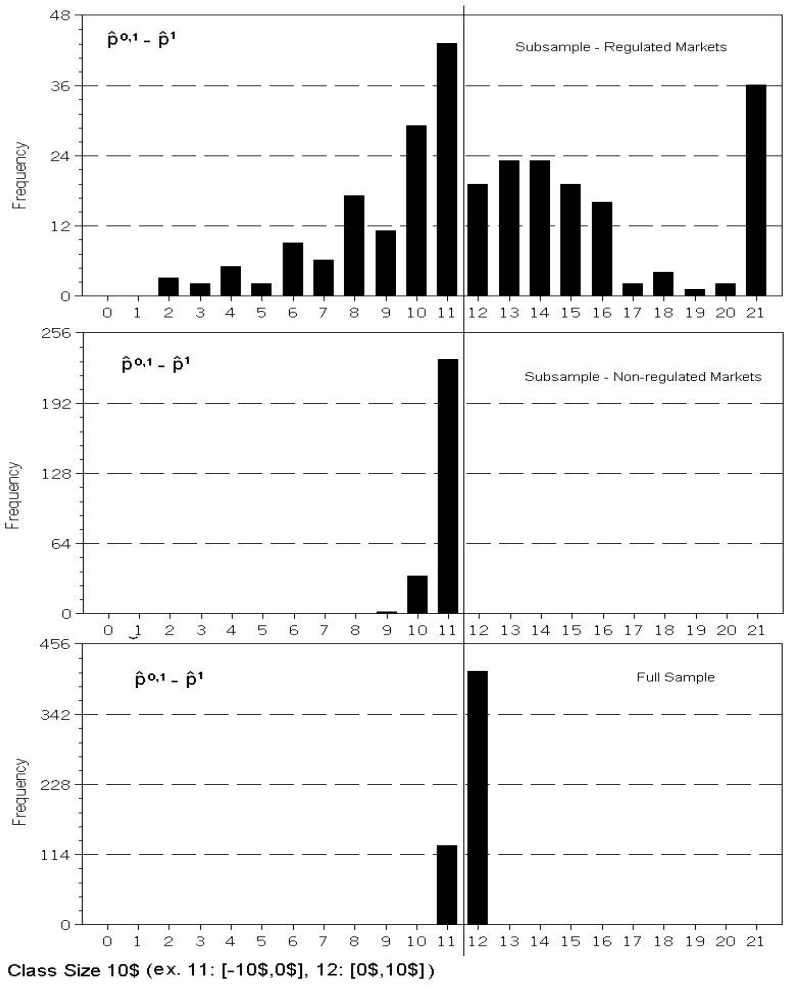

Figure 3.3: Sample Distribution of the Difference Between Non-Regulated and Regulated Prices: Middle Usage Tariff

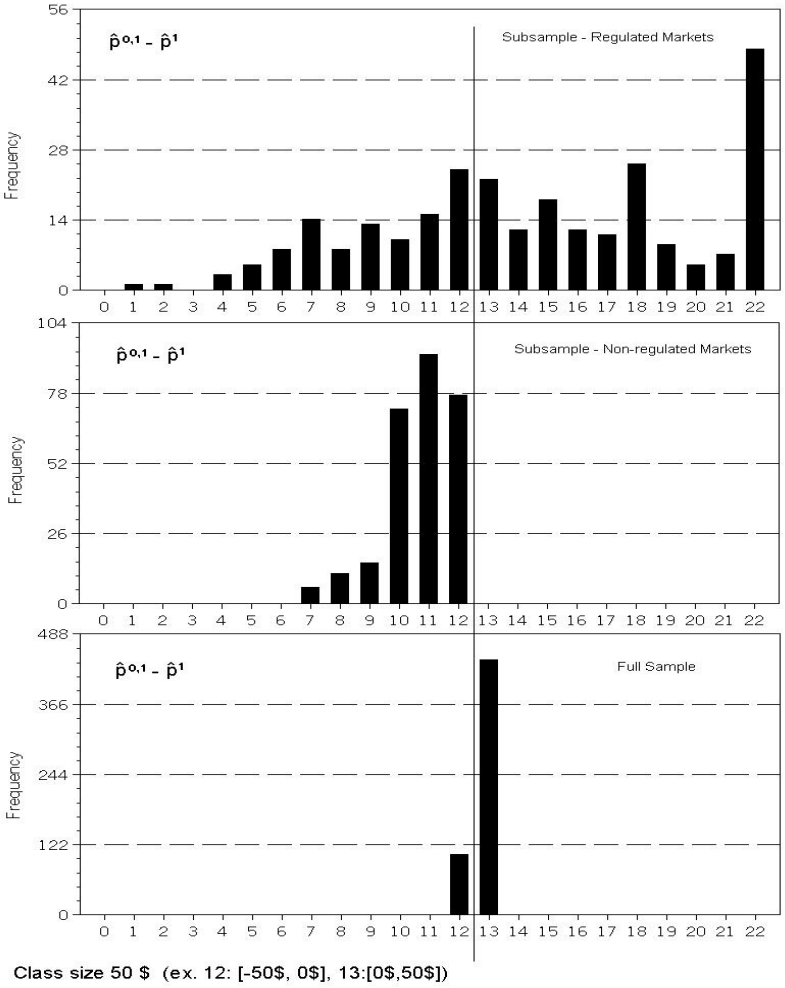

Figure 3.4: Sample Distribution of the Difference Between Non-Regulated and Regulated Prices: High Usage Tariff

Chapter 4

Lobbying and Collusion in a Regulated Industry: The U.S. Mobile Telecommunications Market

A joint work with Astrid Jung

> "Indeed, unless the number of individuals in the group is quite small, or unless there is *coercion or other special device* to make individuals act in their common interest, rational, self interested individuals will not act to achieve their common or group interests". Mancur Olson (1965, p. 2)

4.1 Introduction

The aim of this chapter is to empirically explore the relationship between market collusion and industry lobbying in a regulated market. Using data from the U.S. mobile telecommunications industry, we test whether the amount of firms' contributions to political parties has an influence on their product market conduct and whether the latter has an impact on firms' political decisions.

We first analyze the case of exogenous firms' lobbying expenditures and then study the situation of endogenous lobbying, in order to jointly consider firms' strategic behavior in the product and political markets. The idea is that in a regulated market such as the U.S. mobile telecommunications industry, firms interact along two dimensions: The product market and the political arena where the policy decisions are made.[1]

Since Olson (1965), it has been recognized that there exists a coordination problem in lobbying formation: Why should different self-interested individuals participate in a pressure group? Even though these individuals might realize their common interest - in our case a favorable regulatory environment - they will, as a group, only achieve the optimal result if a mechanism that deters the free-riding behavior is available. The same line of argument has been applied to the coordination problem faced by firms in the product market in order to sustain collusive agreements (see Porter, 1983 and Green and Porter, 1984). Motivated by these observations, the question arises whether cooperation in the product market is related to cooperation in the political arena thus to firms' lobbying activities.

Apart of the theoretical interest, the issue studied in this chapter is also policy-relevant. The regulation of campaign contributions as well the role of product market regulation are, in fact, hotly debated topics in many democratic countries, especially in the U.S. Yet, we are not aware of any study that analyzed product market regulation's impact on firms' lobbying decisions and, similarly, whether and how restrictions on campaign financing could affect firms' product market behavior. The empirical evidence delivered in this chapter can thus shed some new light on this issue, particularly on the nature of the link between the two kinds of markets.

To the best of our knowledge, there does not exist any theoretical contribution that analyzed the relationship between collusion and lobbying decisions in an industry where firms' tariffs are regulated, and from which structural empirical equations can be derived. Therefore, we employ a structural model

[1]For a theoretical discussion of the relationship between firms strategic behavior in product and in political markets see for instance Baron (1999) and, more in general, Baron (2001).

only for the market interactions, while our methodology concerning firms' political behavior is, in a theoretical sense, based on a reduced form approach. However, since a reduced form analysis of lobbying requires a careful interpretation of the underlying political game, we make use of theoretical arguments to motivate and discuss our empirical findings. For this purpose, we partition the link between collusion and lobbying expenditures into two elements that have been separately analyzed in the literature: the relationship between firms' coordination in the product market and firms' coordination in the political arena on the one hand, and the connection between the latter and firms lobbying expenditures on the other.

Insight on the first aspect, i.e. how cooperation in the product and political markets is interrelated, is provided by the idea of multimarket contact (Bernheim and Whinston 1990). Applying their setting to our problem, we expect that individual deviation from the collectively optimal lobbying contributions would not only be punished by returning to the one-shot political equilibrium but also by abandoning cooperation in the product market. Thus, as long as market cooperation itself is sustainable, it might help to deter deviation in the lobbying game. As a result one expects to observe a positive relationship between product market collusion and coordination in lobbying formation.

Ludema (2001) analyzes the interrelation between collusion and lobbying for a public good type regulation in a trade model. He shows that the profit increase due to a favorable policy is greater for those agents who deviate from coordination in the political market because the others bare the cost of lobbying and detect cheating in lobbying with one period lag. Hence, if there is not enough slack in the incentive compatibility constraint of collusion, collectively optimal lobbying efforts may destabilize market cooperation. This extension of the multimarket idea which, in its original version, does not allow cooperation in one market to alter the gains from cooperation in the other, leads to ambiguous predictions about the multimarket effect in situations where players observe defection with a lag.[2]

[2]Damania and Fredriksson (2000) study the endogenous formation of industry pressure groups in a environmental regulation model. They find that collusion in the product market helps to deter deviation in the political market even when product market penalties for

The second aspect, i.e. the relationship between coordination in the political market and firms' lobbying expenditures, has been analyzed in the political economy literature. In the case of lobbying for a pure public good, an increase in coordination among firms lead to higher contibutions because it alleviates the free-riding problem in group formation. When, in contrast, firms within an industry are asymmetric and a specific type of regulation hurts some of them while benefiting others, lobbying may be interpreted as a way of acquiring a private good. A general insight from the rent seeking literature is that total lobbying expenditures increase with the number of competing individuals or groups (see Nitzan, 1994). Since improved coordination among rent seekers can be interpreted as a decline in the number of *competing* parties, it will trigger a drop of rent seeking efforts.[3] A similar result is derived also by Bernheim and Whinston (1986) for menu auctions: Firms that manage to align their interests on policy choices limit the politicians' ability to extract rents. Hence, total lobbying expenditures diminish.

As the discussion above demonstrates, the conclusions from the theoretical literature concerning the relationship between market conduct and lobbying expenditures are intuitively appealing but ambiguous. Our empirical assessment is aimed at providing evidence on the relevance of these countervailing effects.

One first novelty of this work is that we explicitly analyze how campaign contributions affect collusive behavior. We are not aware of any study that poses this question. Second, in our full model we go one step further and explicitly take into account the simultaneity between firms' product and political market's behavior, empirically implementing the ideas recently developed in the theoretical literature (Damania and Fredriksson, 2000; Baron, 2001; and Ludema, 2001)

A noticeable difference of our approach with respect to the existing empirical literature is that we purposely analyze the role of collusion rather than of

lobbying deviation are excluded. Their result relies, however, on a very specific model of regulation which can be the main driver of the obtained findings.

[3]This holds even if we take into account that, within a group of coordinated firms, the rent has the character of a public good (Katz et al. 1990).

concentration on firms' campaigning activities.[4] We do this because our focus is on the firm not only as a production but also as a political entity, hence we study firms' strategic behavior in the market rather than market structure.[5] This theoretical idea has repercussions on the empirical methodology that we choose: Whereas previous studies have looked at the impact of exogenous concentration ratio on campaign contributions in reduced-form one-equation models, we estimate market conduct through a system of simultaneous equations and relate it to the firms' endogenous lobbying. Thereby, this study is a first attempt to take advantage of the structural empirical approach traditionally developed in industrial organization in order to analyze political economy issues.

The data we employ stems from the U.S. mobile telecommunications industry during its early development phase in the second half of the 1980's. The structure of the data is uniquely suited to investigate the interrelation between market conduct and lobbying expenditures because the U.S. cellular industry is divided into many small geographical markets and the regulatory decisions as well as the amount of firms' political activities vary across states. Thus, the data contains sufficient variation to identify and estimate the market conduct, the firms' lobbying behavior as well as their relation. At the same time, by focussing on a single industry in one country, the unobserved heterogeneity problem is minimized.

This study have two main results: First, we find a negative and significant relationship between firms' conduct and lobbying activities: high contributions

[4] A few studies find that concentration has a positive and significant effect on campaign contributions (e.g. Pittman, 1988), others obtain a negative and significant relationship (Salomon and Siegfried, 1977 , and Zardkhooi, 1985). The majority, however, do not find any significant effect or mixed results (e.g. Grier, Munger, and Roberts, 1991 and Grier and Munger, 1991). Also, see Potters and Sloof (1996) for an excellent survey of the empirical literature on interest groups.

Recently, a number of theoretical contributions have also accounted for endogenous lobbying formation focusing on the role of market structure as a coordination device (e.g. Mitra, 1999; Pecorino, 1998; Pecorino, 2001; and Hillman et al., 2001).

[5] Of course, market structure is an important determinant of firms' conduct, which we have controlled for in our empirical analysis.

decrease collusion. Second, we show that a collusive market outcome significantly decreases firms' campaign contributions. The strength and significance of these effects varies among the different specifications, but the qualitative result is very robust to changes in the model's specification. The theoretical literature discussed above offers two possible interpretations for this result. Either, following the multimarket argument, coordination in one market helps to sustain coordination in the other. Thus, the negative link between lobbying expenditure and product market behavior must be due to the fact that firms perceive regulation as a private good and increased coordination in lobbying reduces total rent seeking effort. Or, if regulation is perceived as a public good, collusion and coordination in lobbying must indeed be negatively related since increased coordination in the political market implies higher lobbying expenditures.

The chapter proceeds as follows. Section 2 briefly presents the U.S. cellular market and the data. In Section 3 we develop a structural model of market interactions and present our empirical specification where we first consider firms' lobbying activity as exogenous. In Section 4 we present a reduced form version of firms' endogenous behavior in the political market and empirically implement the lobbying equation. Section 5 discusses the main findings and, finally, we conclude in Section 6 with some remarks and suggestions for further research.

4.2 The Data

The regulatory and market environment in the U.S. cellular market in the second half of the 1980's are unique and constitute an excellent natural experiment for the analysis of the relationships between lobbying and collusion. On the one hand, we observe, for the production as well as for the political decisions, many geographically separated markets within a single industry (for the former the Metropolitan Statistical Areas and for the latter the states). This fact guarantees enough heterogeneity - in the sense of statistical variation - to investigate the empirical interrelation between market level collusion and state level lobbying.

On the other hand, the product market is homogeneous, which justifies the same functional specification of the demand and first order condition across markets. Moreover, because of the homogeneity of the institutional environment across U.S. states, unobserved heterogeneity in the estimation of the lobbying equation is minimized.

Another important characteristic of the U.S. mobile telecommunications market is that the market structure was exogenously determined during the entire sample period. Each of the considered markets started at the beginning of the 1980's as a monopoly and was subsequently opened up to a second firm, so that we can concentrate on market conduct in a specified market structure. This peculiarity also allows us to rule out more complex games where firms make their production decisions under the pressure of potential entry.

Without the described advantages in the data structure, it would be very difficult to empirically model and analyze the relationship between market conduct and campaign contributions.

The database that we use is remarkably rich. It contains product market variables such as prices, output, demand, cost, and market structure variables and it covers information about the regulatory and the political environment, such as the structure of the regulatory body and the composition of the states' governments and legislatures. Furthermore, it entails data on firms' political activity as measured by their campaign contributions to the political parties.

Part of the data has been already exploited in other studies. The market data were collected and used by Parker and Röller (1997), and, as we will make clear afterwards, we rearranged them in order to solve an aggregation problem between market and state level decisions.[6] The political data originates form the *Book of the States* and from the *U.S. Statistical Abstract*. The data on political contributions were kindly provided by the Center of Responsive Politics

[6]The data originate from many different sources, such as *Cellular Price and Marketing Letter*, *Information Enterprise*, *Cellular Business*, *Cellular Market Data Book*, *EMCI*, *BOMA Experience Exchange Report*, U.S. Department of Energy, U.S. Department of Labor, Bureau of Labor Statistics, U.S. Department of commerce, and Bureau of Census. We refer the interested reader to Parker and Röller (1997) for a more precise description of the market data. We are very grateful to Phil Parker and Lars-Hendrik Röller for allowing us to use their data.

that elaborates figures stemming from the Federal Election Commission.[7]

Tables 4.1 4.2 report a brief description of the variables used in this study, whereas Tables 4.3 and 4.4 contain the preliminary statistics. The first column refers to the full sample, which corresponds to Parker's and Röller's original data after a selection process. Observations in this sample do not follow a specific periodicity. The aggregated sample represented in the second column of the table, denotes the average observation for a given year calculated in order to match the market variables to the lobbying data which is observed on a yearly basis. As a result the new market data contains one to four yearly observations for each of the considered 72 metropolitan markets. The differences in the mean and standard errors of the variables between the two samples are very small and not statistically significant.

Apart from market price (P) and quantity (Q), we have information on demand shifters like the market population (POP), annual income per capita (INCOME), population density (DENSITY), and the number of high potential business establishments (BUSINESS). The data on cost shifters include the cost of energy (ENERGY), office and operation costs (RENT and OPERATE), labor costs in the cellular industry (WAGE), and cost of capital (PRIME). The market structure variables are a dummy equal to one for the duopoly period (ENTRY), a dummy indicating whether both licence holders were Bell companies (BB), a measure of whether the two firms in one market are partially own by the same organizations (CROSSOWN), and in how many markets the two firms meet (MULTIMKT). A dummy equal to one indicates whether the market was subjected to any form of price regulation (PREG).

In Table 4.4 we report statistics for the political variables, which constitute a balanced panel with four yearly observations for each of the 40 states included in our sample. The information covers the composition of legislature and government in the different states: a dummy equal to one if the governor came from the democratic party (GOVDEM), the governor's salary (GSALARY), and a dummy equal to one if the democratic party had the majority in both branches of the legislature (LEGDEM). Variables related to

[7]In particular, we thank Douglas Weber from the Center for Responsive Politics for making available the unpublished data on political contributions for the sample period.

the regulatory body are the Public Utility Commission's (PUC) number of board members (PUCMEM), the length of their office (PUCTERM), their salary (PUCSALARY), and the number of PUC's full-time employees (PUCSTAFF). The dummy ELECT takes the value one if the PUC's members were directly elected by the citizens and not appointed by politicians. Indicators of election years (PRESELECT, FEDELECT, LEGISELECT) and of the tightness between the political parties at the state level (TIGHT) are also included in the data set. Further potential controls for the lobbying process are the population of the state (POPSTATE) and its average income (INCSTATE). Finally, lobbying is measured by yearly aggregated campaign contributions by mobile telecommunications firms to members of political parties in a given state.

All political variables lag one year with respect to the market and lobbying data because a newly elected government needs some time before being able to implement policy changes.

4.3 Collusion and Exogenous Lobbying

As we pointed out in the previous section, we do not work out a complete theoretical model for firms' behavior in product and political markets when the industry is subject to different forms of price regulation. Even though, in a micro-founded model, regulation should be considered endogenous, because firms' political activity is aimed at influencing the regulatory environment, the focus of this chapter is on the interrelation between firms collusion and lobbying. Hence, the chosen empirical approach is only partially derived from a formal theoretical structure. In this section, we explicitly model firms' interaction in the product market adopting an established approach in industrial organization, which allows us to estimate firms' conduct. In this first step, we assume that lobbying decisions are exogenous and study whether and how they shape firms' market behavior.

In order to model the market interactions among firms, we specify and estimate a structural oligopoly model at the industry level (see Bresnahan 1989). This enables us to identify firms' conduct in the market place through the

simultaneous estimation of a demand function and of the first order condition for the firms' profit maximization problem. The structural model for the product market was already specified and estimated by Parker and Röller (1997). Let the inverse market demand be:

$$p_{tms} = f(Q_{tms}, X^D_{tms}). \tag{4.1}$$

The price for cellular services p_{tms} at time t, in market m within state s depends on the market production Q_{tms} and on a set of market specific demand shifters (X^D_{tms}). We assume that the firm i's specific variable costs $C_{itms}\left(q_{itms}, \omega_{tms}\right)$ are a function of firm-specific output q_{itms} and on a set of exogenous market-specific cost shifters ω_{tms}. Each firm maximizes its profits with respect to the produced quantity. Assuming symmetry among firms within each market we derive the optimality condition at the market level by summing the individual first order conditions over the N_{tms} firms:[8]

$$\theta_{tms}\left(\cdot\right)\frac{\partial p_{tms}\left(\cdot\right)}{\partial Q_{tms}}Q_{tms} + N_{tms}p_{tms}\left(\cdot\right) - MC_{itms}\left(\frac{Q_{tms}}{N_{tms}}, \omega_{tms}\right) = 0. \tag{4.2}$$

Equation (4.2) allows us to estimate market conduct using market data instead of firm level data. The conjectural variation, or conduct parameter $\theta_{tms}\left(\cdot\right)$ measures the degree of market competitiveness. If, in statistical sense, $\theta_{tms} = 0$, the market is perfectly competitive; if $\theta_{tms} = 1/N_{tms}$, firms behave as Cournot-Nash competitors; and if $\theta_{tms} = 1$, then firms' behavior is consistent with monopoly or cartel conduct.

We assume that the conjectural variation $\theta_{tms}\left(\cdot\right)$ is not constant but a market specific varying parameter:[9]

$$\theta_{tms} = g\left(L_{ts}, \mu_{tms}\right), \tag{4.3}$$

where L_{ts} are the total lobbying expenditures by mobile telecommunications firms, as measured by their campaign contributions to political parties, and

[8]For a detailed derivation of this market specific first order condition we refer interested readers to Parket and Röller (1997).

[9]See Mayo and Otsuka (1991) and Parker and Röller (1997) for the estimation of a varying conduct parameter.

μ_{tms} is a vector of market structure characteristics, which further explains firms' conduct. Specifying θ_{tms} as a non-constant parameter is a convenient way of addressing the relationship between the agents' behavior in the product market and in the political process without having a full structural model about the choice of regulation, its influence on profits and campaign contributions at hand.

The implementation of the model discussed above involves the empirical specification of two simultaneous equations (4.1), (4.2) and the varying conduct parameter (4.3). In order to identify the conduct parameter, we choose a semilogarithmic specification for the inverse demand:

$$\begin{aligned} P_{tms} &= b_0 + b_1\ log(Q_{tms}) + b_2\ POP_{tms} + b_3\ TIME_{tms} + \\ &\quad b_4\ BUSINESS_{tms} + b_5\ INCOME_{tms} + b_6\ DENSITY + \epsilon_{tms}, \end{aligned} \tag{4.4}$$

where ϵ_{tms} is an i.i.d. stochastic term. Marginal costs are approximated as a linear function in quantity and the cost shifters:[10]

$$\begin{aligned} MC_{itms} &= a_0 + a_1\ \tfrac{Q_{tms}}{1+ENTRY_{tms}} + a_2\ ENERGY_{tms} + \\ &\quad a_3\ PRIME_{tms} + a_4\ WAGE_{tms} + \\ &\quad a_5\ RENT_{tms} + a_6\ OPERATE_{tms}. \end{aligned} \tag{4.5}$$

As we have $\frac{\partial p_{tms}}{\partial Q_{tms}} = \frac{b_1}{Q_{tms}}$ due to the semilogarithmic specification of the inverse demand function, the empirical version of the firms behavior (4.2) reduces to:

$$p_{tms} = MC_{tms} - b_1\theta_{tms} + \nu_{tms}, \tag{4.6}$$

where ν_{tms} is also an i.i.d. error.

For the sake of identification, we allow the conduct parameter to vary across monopoly and duopoly periods.[11] We use the information gathered by the

[10] Intuition might suggest that there are economies of density in the provision of cellular services, because antennas can be used more efficiently in densily populated areas. In this paper DENSITY is excluded from the cost shifters because, quantity is proxied by the number of antennas and we would not expect the costs of an additional antenna to decrease in population density.

[11] Note that, allowing the conduct parameter to vary across regimes, we also take into account that market structure has an influence on market conduct.

unique market structure also to perform a specification test, since our model should correctly predict the hypothesis $\theta_{tms} = 1$ during monopoly periods. For these periods and for the functional forms assumed in (4.4) and (4.5), we could not reject this hypothesis at the 5% confidence level.[12]

In order to increase the efficiency of our estimates, we then impose this result as a restriction and set θ_{tms} equal to one during monopoly periods. For the duopoly period, we assume that the conduct parameter is a function of several structural characteristics such as market structure variables, regulation, and lobbying expenditures that, at this stage, are taken to be exogenous. To check the robustness of our main results, we adopt two different specifications for the conduct parameter. The first assumes a linear approximation for the conduct parameter during duopoly periods:

$$\theta_{tms} = \begin{cases} 1 & \text{if monopoly} \\ \widetilde{\theta}_{tms} & \text{if duopoly,} \end{cases} \tag{4.7}$$

where $\widetilde{\theta}_{tms} = d_0 + d_1 MULTIMKT_{tms} + d_2 CROSSOWN_{tms} + d_3 BB_{tms} + d_4 PREG_{ts} + d_5 LOBBY_{ts}$.

Yet, since our theoretical model predicts values for the conjectural variation parameter ranging from 0 to 1, we compare the specification above to one which maps the linear approximation of $\widetilde{\theta}_{tms}$ into (0,1). We do this by means of the logistic distribution function that is a strictly monotonic transformation mapping values from the interval $(-\infty, +\infty)$ into the interval $(0, 1)$. The assumed functional form for the conjectural variation parameter is then:

$$\theta_{tms} = \begin{cases} 1 & \text{if monopoly} \\ \frac{1}{1+\exp\left(-\widetilde{\theta}_{tms}\right)} & \text{if duopoly.} \end{cases} \tag{4.8}$$

[12] In order to fully exploit the available information, the test was carried out using the original, non-aggregated data.

We also impose the second order condition for a profit maximum:[13]

$$b_1 = \frac{a_1 \, Q_{tms}}{\theta_{tms} \; ENTRY_{tms} + 1} - exp(e). \tag{4.9}$$

The empirical implementation of the model developed in this section implies the simultaneous estimation of equations (4.4) and (4.6), with the second order condition (4.9) and the varying conduct parameter (4.7) or (4.8) depending on the chosen specification.

4.4 Endogenous Lobbying

In this section, we further develop the previous model in order to account for lobbying endogeneity. We do not have a structural model for the firms' political decision, hence we use insights from the theoretical literature discussed above to derive a lobbying equation. The key idea is that lobbying expenditures depend on firms' ability to coordinate in the political market. Since we do not have a measure of this coordination and since there exists a relationship between coordination in the political and in the product markets, we use the empirically estimated measure of firms' conduct in the product market to proxy for firms' conduct in the political arena. Hence, the lobbying at the state level depends first on an aggregation of conduct in each market within a state. The lobbying equation is the following:

$$L_{ts} = h\left(\theta_{t1s}, ..., \theta_{tMs}, \pi_{t1s}, ..., \pi_{tMs}, \lambda_{ts}\right), \tag{4.10}$$

where $m = 1, .., M$ are the product markets, π_{tms} is a measure of market profitability, and λ_{ts} is a vector of exogenous state-specific characteristics, such as the government's political orientation and the structure of the state regulatory body. We control for the impact of market profitability on the choice to contribute, because one might argue that the firms' incentive to contribute in order to achieve a favorable regulatory environment increases with the benefits, which can be gained in such an environment. Regulatory and political

[13] This is the empirical implementation of the second order condition derived by differentiating equation (4.2) with respect to the total market quantity Q_{tms}.

factors are taken into account, since these shape firms' ability and the cost to effectively influence the policy maker.

The empirical specification of the lobbying equation is then a linear combination of exogenous political and regulatory variables, the conduct parameter, and an endogenous measure of firms' profitability:

$$LOBBY_{ts} = c_0 + c_1 \sum_{m=1}^{M} \gamma_{tms}\, \theta_{tms} + c_2 \sum_{m=1}^{M} \gamma_{tms}\, \frac{p_{tms} - MC_{tms}}{p_{tms}} + \lambda_{ts}\, \mathbf{c_3} + \eta_{ts}, \tag{4.11}$$

where $\mathbf{c_3}$ denotes a vector of coefficients for the political and regulatory control variables in λ_{ts} and η_{ts} is an i.i.d. stochastic term. Note that, since the lobbying equation is estimated at the state level, market specific variables must be aggregated to match this observational unit. An intuitive procedure is to construct a weighted average of the market variables with the weights γ_{tms} reflecting the "relative importance" of a market within the state, which we proxy using the ratio between market population and the total population of the markets belonging to the same state $\frac{POP_{tms}}{\sum_{m \in s} POP_{tms}}$.

The main challenge in investigating how firms' political activity is influenced by their ability to coordinate in the product market is that the latter is usually not directly observable. From equations (4.6) and (4.11) it is apparent that we address the simultaneity between market conduct and lobbying by inserting the variable parameter θ_{tms}, which is to be estimated in the first order condition, into the lobbying equation as if it were observed. Consequently the estimates of d_0 to d_5 result from a parameter constraint over (4.6) and (4.11). This raises the obvious question whether our approach biases d_0 to d_5 and hence θ_{tms}. Such a bias would indeed occur if the exogenous variables that are used to explain conduct had themselves a direct effect on lobbying, which is not accounted for. In order to avoid this problem, we control in equation (4.11) for PREG and POPSTATE, because they are correlated to those variables used in the construction of the aggregated measure of collusion and both are expected to influence lobbying beyond their effect on collusion. It is much more difficult to justify why the non-aggregated, market-level variables MULTIMKT, CROSSOWN and BB should affect state-level campaign contributions and thus we omit them from equation (4.11).

The empirical implementation of the full model implies the simultaneous estimation of equations (4.4), (4.6), and (4.11) with the varying conduct parameter specified in (4.7) or (4.8) and the second order condition (4.9).

4.5 Results

In this section we analyze the results of the non-linear 2SLS estimation of the empirical models developed above. Before presenting the results for the full model, we shortly discuss a preliminary estimation of the market model where we assume a constant conduct parameter and exclude the lobbying equation, with the aim of testing hypotheses about market behavior.

Table 4.5 reports the results of the non-linear 2SLS estimation where we impose $\theta_{tms} = 1$ for the monopoly period as well as the second order condition (4.9), in order to enhance efficiency.[14] The table shows that most of the estimated coefficients in the marginal cost equation are significant and of the expected sign. The effect of quantity is not significantly different from zero, which suggests the presence of constant returns to scale.[15] In the inverse demand equation the per capita income and population density have a significant impact, which is positive as expected. This means, in fact, that cellular prices were significantly higher in rich and densely populated metropolitan areas. The point estimate for the constant conduct parameter is equal to 0.93. At any usual significance level cartel behavior cannot be rejected, while the Nash as well as the competitive equilibrium are ruled out at type-I errors of 10% and 5%, respectively. This result suggests that, on average, firms in the U.S. mobile telecommunications sector colluded during the sample period, such that their conduct cannot be distinguished from monopoly or cartel behavior even after the second firm had entered the market.[16]

[14] As a robustness check, we estimated the same model without imposing the second order condition and verifying, ex post, that it was satisfied.

[15] Note, that it might be crucial for this result that quantity is approximated by the number of cells, i.e. antennas, in the market.

[16] This result was originally obtained by Parker and Röller (1997). The adopted specification is, though, slightly different, which explains the deviations in the point estimates for some of the parameters.

4.5.1 Exogenous Lobbying

The results from the estimation of the market model with a varying conduct parameter when lobbying expenditures are taken to be exogenous are reported in Table 4.6. As we discussed in the previous section, we present two specifications depending on the functional assumptions we impose on the conduct parameter. Qualitatively as well as quantitatively the new findings reflect those derived from the previous model. Some minor differences among models and specifications can however be noticed.[17]

In the marginal cost equation, energy and operational cost drivers lose significance. Also, in the first specification of the demand equation population density is not significant, while population has now a significant and positive coefficient estimate as expected. The major divergences between the two specifications pertains to the coefficients' estimates in the conduct equation. This was expected given that the functional restrictions enter at this stage of the estimation procedure. When we assume a linear specification for the conduct parameter, all coefficients are significant. In particular, the key result is that lobbying expenditures have a negative and significant effect on firms' conduct. This finding, however, does not hold in the second specification where most of the other coefficients' estimates also lose significance. We will discuss this result and its interpretation in the next section. In both specifications, the constant is positive and significant and the cross-ownership parameter has a negative and significant impact on firms' conduct. The variable multimarket has a negative parameter in both specifications but this is significant only in the first one, while the parameter's estimate of the regulatory dummy is negative and significant in the first specification and not significant in the second.[18]

[17] Yet, the sample on which we run this regressions is different than the one we used before. We choose, in fact, to employ the same sample that we will use for the full model also for the market model with varying conduct parameter, in order to make the two models directly comparable. Very similar results were obtained using the full sample.

[18] These results differ considerably from the one obtained by Parker and Röller (1997). However there are many differences between the two analyses. First, we run the regression on a aggregated sample and, second, the adopted specifications differ in several points especially concerning the conduct parameter: Whereas they tested different set of variables separately, we use all exogenous variables together. The major difference is, however, that we control

4.5.2 Endogenous Lobbying

We can now turn to the results from the simultaneous estimation of the full model: the inverse market demand, market supply and lobbying expenditures including the varying conduct parameter and the second order condition (4.9). The findings for the two specifications are presented in Table 4.7. Among cost shifters the office and operational costs as well as the cost of capital are significant and positive as expected in both specification, while energy costs and the constant are significant only in the first one. The estimates are comparable to those presented above. In the second specification of the full model, the estimators in the demand equation perform much more satisfactory in terms of significance and sign. Not only are income and population density significant and positive as seen before, but also the population size is now positive and significant and the time control is significant and negative. These two new results are also in line with intuition, since cellular tariffs are expected to increase with population size and to decrease in time as competition among firms becomes more effective.

One key result that we observe in the full model is that lobbying expenditures do have a negative and highly significant effect on market conduct in both specifications: Higher total contributions offered by the industry to political parties reduce collusion among firms. This might suggest that coordination in the product market and in political activities are perceived by firms as substitutes. A more thorough interpretation of this result will be provided below when we discuss the impact of collusion on lobbying. Notice that the coefficient's size is 8 to 10 times bigger than in the model with exogenous lobbying efforts, meaning that endogeneity matters.

Turning to the other structural characteristics, which are expected to influence market conduct, the divergences between the two specifications are now less sharp than in the previous model. In both specifications cross-ownership structures enhance collusion among firms, while we do not find a significant multimarket effect. Furthermore we observe that Bell companies have an advantage in coordinating relative to independent firms, even though this effect

for firms' lobbying activities while they do not.

is only partially significant in the second specification and not significant in the first. Regulation is found to have a significant and negative impact on firms' ability to collude but only in the first specification, while it is not significant in the second. This implies that firms' ability to sustain collusion was lower in regulated states. The coefficient estimates for the second order condition is significantly different from zero in both specifications, which means that the imposed second order condition is not binding.

As discuss above, our first important finding is that high lobbying expenditures apparently hinder collusive agreements. The second main result of this chapter is that firms in collusive states are less willing to contribute to political parties: The coefficient's estimates for θ are negative and highly significant in both specifications.[19] If we believe, based on Bernheim's and Whinston's (1990) multimarket argument, that coordination in the product market improves the firms' ability to coordinate political actions, the observed negative relationship linking product market collusion to the actual lobbying expenditures must be due to the substitutability between political coordination and lobbying. Interpreted in the light of the rent-seeking literature quoted earlier, this suggests that the contested rent is private. Therefore, the reduction in the number of *competing* players – which is a consequence of coordination – leads to a lower degree of rent dissipation. Similarly, we would expect such a result from the menu-auction approach, were the auctioneer's profits increase with the level of conflict among the bidders. Coordination can be seen as a device that reduces the firms' heterogeneity in valuations about the feasible political decisions by equalizing their payoffs under alternative regimes. As a result of more homogeneous interests, firms spend less money or effort to avoid policies that, without coordination, would have weakened their own strategic position relative to their competitors'. In other words, coordination among conflicting parties reduces the costs of buying a particular policy decision.

As it becomes clear from these arguments, the observed negative relationship between lobbying and collusion cannot be explained if fighting regulation were a pure public good for the firms. This would be the case if tacitly colluding

[19]However, the coefficient's size varies due to the fact that, in the first specification, the conduct parameter is defined between -∞ and +∞, while in the second between 0 and 1.

firms shifted themselves into a situation were collusion is no longer incentive compatible, by contributing the collectively optimal lobbying expenditures as pointed out in Ludema (2001). This effect, however, relies on the existence of an observational gap which unveils deviation in lobbying only one period after the market game has finished.[20]

In explaining lobbying expenditures, current market profitability measured by the price-cost margin is found to have a slightly significant negative impact only in the second specification, while it is not significant in the first one. The interpretation of this result follows the same argument presented above, i.e. the substitutability between market power and lobbying activities, since the price cost margin is expected to increase with market power. Also the future attractiveness of the markets within a state positively affects the political activity: While a greater size of the population clearly shifts lobbying upwards in both specifications, the coefficient of per capita income is not significant. However, we can exclude a negative effect on lobbying at the 10% level. The fact that future market profitability seems to be important for the firms tendency to lobby politicians can be explained with the lag between the payment of campaign contributions and the actual policy decision.

About the political and regulatory variables which were used as controls in the lobbying equation, we observe the main differences in the coefficients' size and significance between the two specifications. In the first one, the governor's salary and the number of full time employees in the PUC have a negative and significant impact on lobbying expenditures. The former can be attributed to an income effect: The higher the salary a governor earns from his or her position, the more difficult it is for rent seekers to advance their interests by means of monetary contributions. As a consequence interest groups might simply find it too costly to pursue their political goals or switch to nonmonetary lobbying which we exclude in this study. Regarding the second result, a possible interpretation is that politicians have less influence on larger bureaucratic institutions than on smaller. Thus, large PUCs reduce the degree of efficiency to

[20]This limitation substantially reduces the attractiveness of Ludema's point, especially because it is empirically difficult to identify the existence and the length of this observational gap.

which firms campaign contributions affect regulatory decisions in the cellular market. However both effects disappear in the second specification.

Interestingly, campaign contributions decrease with regulation, but this finding is only significant in the first specification. While, at first glance, this is surprising given the negative impact regulation had on the firms ability to collude, it might reflect an asymmetry in the cost of influencing regulatory decisions. This would imply that it is less expensive to prevent regulation than to abolish it once it has been adopted, such that firms eventually find it unprofitable lobbying in order to return to the non-regulated scheme. Finally, we find that political contributions have been higher in federal election years echoing the needs of candidates to finance their elections campaigns. In an attempt to estimate a parsimonious model, we omitted the control variables GOVDEM, LEGDEM, PUCMEM ,PUCTERM, PUCSAL, ELECT, PRESELECT, LEGISELECT and TIGHT from the final estimation because their effect was not significant in any model that could be obtained by including some or all of these variables into the specification of Table 4.7.

4.6 Conclusions

This chapter empirically investigates the relationship between market collusion and lobbying expenditures. We explicitly model that firms' conduct in the product market influences firms' decisions about contributions to the political system and, simultaneously, that their lobbying activities shape their product market behavior as well. Our intuition is that cooperation in the product market, by affecting cooperation in the political market, can be expected to have an impact on lobbying expenditures. Depending on the nature of the contested rent, the effect can be positive or negative. The Aim of our study is to analyze its existence and sign. Because of its unique regulatory and market environment, we used data from the U.S. mobile telecommunications industry that guarantees enough variation in all relevant dimensions to identify firms' market and political behavior. In order to estimate market interactions, we adopt the conjectural variation approach, which we have modified in order to allow for a varying conduct parameter across markets and augmented by

the estimation of the endogenous lobbying decisions. Since regulatory decisions are made at the state rather than at the market level, we estimate the lobbying equation using the states as the observation unit, whereas the market game is structurally estimated using the Metropolitan Statistical Areas as the observation unit. The different models are estimated by non-linear 2SLS.

We find a strong, robust, and significant relationship between our measure of collusion and the industry's lobbying expenditures. In both directions, this relation is negative, implying that higher lobbying expenditures foster a more competitive industry and that collusive conduct reduces firms' willingness to contribute to the political system. Our interpretation of this result relies on a multimarket contact type of argument. If product market collusion acts as a coordination device in lobbying formation, firms in collusive markets achieve a reduction of the degree of conflict among themselves through coordination. Thus, they are better able to extract rents from the interactions with the political system and therefore campaign contributions are reduced.

Our results, pointing out the existence of this strong relationship, are a first step into a deeper comprehension of the political economy of industrial organization. In order to fully understand firms' behavior in a regulated industry, one should be aware of the fact that they interact not only in the product market but also in the political arena, and that their conduct in the two markets is interrelated. This consideration has important policy implications. Assume that the regulatory authority has instruments to successfully fight collusive behavior in order to enhance consumers' welfare. If product market cooperation is positively related to firms' cooperation in the political arena, then a regulatory intervention that reduces collusion will also decrease coordination in lobbying. In the case of a private good type of regulation, this implies an increase in campaign contributions, which amounts to a welfare reduction, since lobbying expenditures are partially wasteful.[21] Although this argument does not cover all welfare aspects, it illustrates that ignoring the indirect impact of competition policy on firms' political activities might bias the evaluation of its benefits. Similarly, limitations on campaign contributions

[21] We thank Johan Lagerlöf for pointing out to us this possible mechanism.

might have unexpected welfare effects by influencing firms' behavior in the product market.

We think that the advantages of structural modeling as developed in the industrial organization tradition might be also used to improve empirical analysis in the field of political economy. Our study is a first step in this direction. A challenging task for future research is to extend the structural analysis used to model product market interactions to the firms' political behavior. Beyond that, the interactions between firms and policy makers should also be considered in a political economy model of regulation. Thus, a full structural empirical model, where regulation and firms' behavior in the product as well as in the political markets are endogenously considered, seems to be the natural extension of our approach.

4.7 Tables

Variables	Definition	Source
p	Monthly bill for 500 minutes usage (if consumers chose the least expensive plan)	Parker-Röller (1997)
Q	Quantity proxy: Total number of cells in a given network	
TIME	Time trend in months	
POP	Market (MSA) Population in million inhabitants	
INCOME	Market (MSA) annual income per capita in 10.000 $	
BUSINESS	Number of high-potential business establishments (business, health care,professional and legal services, contract construction, transportation, finance,insurance,real estate) divided by 1000	
ENERGY	Average monthly cost per square foot of office space (in $)	
PRIME	One period lagged prime lending rate	
WAGE	Average weekly salary per employee for the cellular industry (in 100 $)	
RENT	Average monthly rent per square foot of office space	
OPERATE	Average monthly general overhead and operating expenses per square foot of office space	
ENTRY	Dummy=1 after the second carrier enters into the market	
BB	Dummy=1 if both competitors in the market are RBOCs	
CROSSOWN	Dummy=1 when the two competitors in one market are partner in any other market	
MULTIMKT	Total number of markets where the two competitors face each other	

Table 4.1: Definition of Market Variables

Variables	Definition	Source
PREG	Dummy=1 if no price regulatory ban was imposed in the market	Duso (2001)
GOVDEM	Dummy=1 if the State's Governor was from the democratic party	The Book of States and
GSALARY	Governor's annual salary in 10.000 $	The U.S. Statistical Abstract
LEGDEM	Dummy=1 if the Democrats had a majority in both branches of the legislative	
PRESELECT	Dummy = 1 if year of presidential election	
LEGISLELECT	Percentage if the state's legislature that was up for election in a given year	
FEDELECT	Dummy = 1 if year of federal election (Senate and House)	
TIGHT	Absolute value of the difference between Republicans' and Democrats' seats in the state´s legislature	
PUCMEM	Number of Members the State Public Utility Commission (PUC)	
PUCTERM	Length of term of the PUC members (years)	
PUCSTAFF	Number of full-time employees in the State Public Utility Commission	
PUCSAL	PUC members' annual salary in 10.000 $	
ELECT	Dummy=1 if the regulator was elected	
POPSTATE	State Population in million inhabitants	
INCSTATE	State annual income per capita in 10.000 $	
LOBBY	Total industry annual campaign contributions in 10.000 $ (without AT&T)	Center of Responsive Politics

Table 4.2: Definition of Political and Regulatory Variables

	Full sample		Aggregated sample	
Variable	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
p	1.972	0.393	1.952	0.400
Q	15.665	17.346	15.097	16.976
TIME	49.240	12.342	51.309	13.879
POP	0.186	0.266	0.172	0.251
INCOME	2.825	0.375	2.809	0.371
DENSITY	0.502	0.398	0.479	0.372
BUSINESS	2.247	0.413	2.226	0.426
ENERGY	1.760	0.372	1.764	0.376
PRIME	9.456	1.107	9.363	1.150
WAGE	5.197	1.285	5.239	1.342
RENT	16.247	4.904	16.526	4.884
OPERATE	6.704	1.683	6.622	1.688
ENTRY	0.680	0.467	0.699	0.449
BB	0.121	0.327	0.115	0.318
MULTIMKT	3.589	2.890	3.580	2.804
CROSSOWN	0.347	0.477	0.337	0.473
Observations	478		287	

Table 4.3: Preliminary Statistics - Market Variables

Variable	Mean	Std. Dev.
GOVDEM	0.619	0.487
GSALARY	7.275	1.689
LEGDEM	0.650	0.478
PRESELECT	0.250	0.434
LEGISLELECT	0.385	0.417
FEDELECT	0.500	0.502
TIGHT	0.315	0.236
PUCMEM	3.988	1.336
PUCTERM	5.456	1.181
PUCSTAFF	209.394	201.180
PUCSALARY	5.549	1.347
ELECT	0.200	0.401
POPSTATE	0.562	0.533
INCSTATE	1.309	0.251
LOBBY	3.150	2.881
PREG	0.500	0.502
Observations	160	

Table 4.4: Preliminary Statistics - Political Variables

	Coefficient	Std. Err.	
Marginal Cost			
constant	0.229	0.486	
Q	-0.008	0.005	
ENERGY	-0.130	0.050	***
PRIME	0.086	0.037	**
WAGE	0.023	0.016	
RENT	0.020	0.005	***
OPERATE	0.046	0.016	***
Demand			
constant	2.148	0.259	***
POP	-0.019	0.487	
TIME	-0.003	0.003	
BUSINESS	0.076	0.057	
INCOME	0.158	0.073	**
DENSITY	0.298	0.068	***
Second Order Condition			
e	-0.850	0.269	***
Conduct Parameter			
θ_{tms}	0.928	0.405	**

Non-linear 2SLS; 478 Observations; Second order condition (4.9) imposed; *** and ** denotes respectively significance at the 1% and 5% levels.

Table 4.5: Market Model - Constant Conduct Parameter

	First Specification (linear approx. for θ)			Second Specification (restricted θ)[a]		
	Coefficient	Std. Err.		Coefficient	Std. Err.	
Marginal Cost						
constant	0.748	0.227	***	0.221	0.314	
Q	-0.002	0.002		0.005	0.004	
ENERGY	-0.082	0.055		-0.049	0.067	
PRIME	0.786	0.019	***	0.834	0.024	***
WAGE	-0.008	0.016		0.017	0.018	
RENT	0.024	0.005	***	0.023	0.007	***
OPERATE	0.028	0.016	*	0.026	0.021	
Inverse Demand						
constant	1.749	0.236	***	1.849	0.309	***
POP	0.820	0.271	***	0.379	0.370	
TIME	-0.0001	0.002		-0.001	0.002	
BUSINESS	0.004	0.065		0.080	0.059	
INCOME	0.143	0.079	*	0.248	0.080	***
DENSITY	0.134	0.109		0.355	0.096	***
Second Order Condition						
e	-2.081	0.342	***	-0.753	0.284	***
Conduct Parameter						
constant	2.320	0.585	***	2.793	1.514	*
MULTIMKT	-0.203	0.053	***	-0.161	0.189	
CROSSOWN	-0.964	0.385	**	-1.948	1.180	*
BB	-0.835	0.375	**	-	-	
PREG	-0.160	0.078	**	0.278	1.016	
LOBBY	-0.055	0.027	**	-0.090	0.114	

Nonlinear 2SLS; 287 observations; Second order condition (4.9) imposed; ***, **, and * denotes significance at the 1%, 5%, and 10% levels respectively. In the second specification we eliminate BB form the conduct parameter becuase it causes convergence problems in the estimation..

[a] By imposing the logistic distribution function as a specification's restriction, θ is bounded to (0,1)

Table 4.6: Market Model - Varying Conduct Parameter - Exogenous Lobbying

	First Specification (linear approx. for θ)			Second Specification (restricted θ)[a]		
	Coefficient	Std. Err.		Coefficient	Std. Err.	
Marginal Cost						
constant	0.536	0.259	**	0.293	0.251	
Q	-2e-04	9e-04		8e-04	0.001	
ENERGY	-0.107	0.064	*	-0.098	0.064	
PRIME	0.092	0.021	***	0.105	0.020	***
WAGE	0.021	0.017		0.018	0.017	
RENT	0.023	0.007	***	0.022	0.007	***
OPERATE	0.038	0.020	*	0.038	0.020	*
Inverse Demand						
constant	1.787	0.208	***	1.745	0.211	***
POP	0.167	0.120		0.304	0.151	**
TIME	-0.006	0.002	***	-0.004	0.002	**
BUSINESS	0.051	0.053		0.062	0.052	
INCOME	0.105	0.065		0.150	0.066	**
DENSITY	0.265	0.083	***	0.290	0.082	***
Second Order Condition						
e	-3.335	0.383	***	-1.878	0.278	***
Conduct Parameter						
constant	2.346	0.338	***	3.610	0.359	***
MULTIMKT	-0.055	0.034		0.037	0.044	
CROSSOWN	0.157	0.051	***	0.828	0.309	***
BB	0.253	0.169		0.466	0.269	*
PREG	-0.466	0.051	***	0.230	0.206	
LOBBY	-0.489	0.049	***	-0.335	0.070	***
Lobbying Equation						
constant	3.795	0.664	***	19.272	4.719	***
θ_{ts} (conduct parameter)	-1.610	0.164	***	-17.684	4.619	***
Price cost margin	-0.075	0.350		-0.746	0.422	*
GSALARY	-0.190	0.069	***	-0.088	0.078	
PUCSTAFF	-0.002	0.001	**	-9e-04	7e-04	
INCSTATE	0.532	0.410		-0.441	0.449	
POPSTATE	2.327	0.327	***	2.799	0.340	***
PREG	-0.883	0.177	***	-0.305	0.240	
FEDELECT	0.751	0.193	***	1.271	0.211	***

Nonlinear 2SLS; 287 observations; Second order condition (4.9) imposed; for parsimony, the political control variables GOVDEM, LEG_DEM, PUCMEM , PUCTERM, PUCSAL, ELECT, PRESELECT, LEGISLELECT, and TIGHT were omitted from the final estimation because their effect was not significant in any model that could be obtained by augmenting the above specification by these variables.
***, **, and * denotes significance at the 1%, 5%, and 10% levels respectively.
[a] By imposing the logistic distribution function as a specification's restriction, θ is bounded to (0,1)

Table 4.7: Full Model - Varying Conduct Parameter - Endogenous Lobbying

Chapter 5

Concluding Remarks

This thesis proposes a new approach to the empirical analysis of the political economy of the regulatory process, which bridges the political economy and industrial organization traditions. Throughout this study, I argue that it is necessary to explicitly model the entire political process that constitutes regulatory decisions in order to correctly understand how these are made and how they impact on the market. The regulatory process is, in fact, the product of interactions among different agents in the political as well as in the product markets. Firms interact with each other in order to determine the market outcome, but also to shape the regulatory environment in which they operate, which develops out of the interplay among firms, politicians, and bureaucrats.

The adopted empirical approach consists of different methodological steps. In the first part of the thesis, which is more in line with the empirical political economy literature, I concentrate on the role of the state. I ask how the structure of the policy maker and its institutional environment shape policy choice and, in particular, the ability to implement policy change such as a reform of the regulatory environment.

In order to do that, I exploit the cross-sectional and time-series variation observed in the deregulation of the mobile telecommunications industry among OECD countries and estimate an one-equation reduced-form model of regulatory intervention with panel techniques. This first step, which perhaps is the least innovative from a methodological point of view, is nevertheless necessary

to understand the role of political forces - in particular political and regulatory institutions - in influencing policy outcome or, in other words, to endogenize the political process behind policy making. The richness of the available political data allowed me to test predictions stemming from various theoretical approaches developed in political economy and political science.

The first essay illustrate that political considerations significantly matter in explaining regulatory policy: Regulation is the product of a political process which must be modeled. I show that a country's political constitution has an impact on its regulatory policy decisions. Political institutions, in fact, shape agents' incentives to take part in the political process. So, for instance, among OECD states majoritarian countries were better able to implement policy reform than countries with proportional electoral rules or with a consensus-type of democracy. Also, the types of governments and their ideological and programmatic positions shaped their ability to implement the deregulation of the cellular markets, even though they seem to have affected more the speed than the organization of the regulatory process. The independence and accountability of the regulatory agency had a strong impact on the regulatory decisions. A more independent regulator seems to have reduced the degree of liberalization in the mobile telecommunications industry. However, the lack of data did not allow me to make clearer predictions about this issue, which surely deserves a much deeper analysis. I also found evidence that firms take part in the policy making process and showed that strong incumbent firms limited the extent of entry deregulation in their industry. Although this result is a first step into the analysis of the private interests theory of regulation, I point out the need of modelling the interactions between product and political markets for a correct assessment of determinants and effects of regulation.

The second and more innovative step, which methodologically is strongly connected with the modern empirical industrial organization tradition, consists of studying firms' behavior, their strategic market and non-market interactions, and the interactions between firms and the policy maker in the political arena. To address this issues, I move from the simple estimation of one-equation models towards the development of more complex systems of equations, which allow me to simultaneously study the strategic behavior of the different agents

interacting in the markets.

The two essays that constitute the second part of this thesis follow this approach. In Chapter 3, I analyze price regulation's impact on firms' pricing behavior, taking into account the regulatory choice's endogeneity. I do that by estimating an endogenous switching regression model that allows me to study how the political and regulatory environment, as well as the lobbying activities of firms shape the choice of regulatory regime while simultaneously considering firms' strategic behavior in the regulated product market. In this second essay, using data from the U.S. mobile telecommunications industry, I showed the importance of considering the endogeneity of regulation when questioning its effects on firms behavior: Regulation must be considered endogenous because of the firms' lobbying activities. The data strongly support this hypothesis. Taking regulation's endogeneity into account, I showed that its effect on cellular tariffs has been limited. In those markets which were regulated, cellular tariffs would not have been significantly lower with than without regulation. Yet, I also showed that this would have been the case in non regulated markets, if regulation had been implemented. The explanation for this phenomenon, stemming from my empirical analysis, is that firms managed to avoid a regulated environment exactly in those market were regulation would have been tough. Moreover, I also showed that the political and regulatory environment played a central role in the determination of this particular policy. The political affiliation of states' governments as well as the structure and characteristics of the regulatory authority shaped their price regulatory decisions.

In Chapter 4, together with Astrid Jung we focus on the interactions among firms not only in the product market but also in the political arena. The idea is that firms behave strategically when they make production decisions as well as when they make non-market decisions such as exerting lobbying efforts. Moreover, these choices are interrelated, since they are two aspects of the same maximization problem. In this chapter, the connection with the empirical industrial organization literature is even stronger. We adopted the conjectural variation approach, which is an established tool in the empirical analysis of firms' behavior and which allows us to identify firms' conduct by

simultaneously estimating a demand function and a first order condition for the firms' profit maximization problem. This standard methodology has been augmented in order to encompass also endogenous firms' political decisions. Therefore, we were able to address the question of whether and how firms' collusive conduct in the product market and their lobbying expenditures are interrelated. We showed that firms' lobbying expenditure have a strong and significant negative impact on firms ability to collude, and that a high degree of cooperation in the product market reduced firms lobbying expenditures. The interpretation for this result is that cooperation in the product market, by acting as a coordination device in the lobbying formation, reduced the conflict among competing firms, hence increasing their ability to extract rent from the political process. Also, we showed that the political and regulatory environments shaped firms lobbying decisions.

The development of databases which allow us to implement the proposed econometric models and to test theoretical predictions, is one important element of an empirical study. In this thesis, I worked out two new databases by merging information from various sources. The first database focuses on the deregulation of the mobile telecommunications industry in OECD countries during the 1990's. Specific data on regulatory policy and regulatory institutions stemming from different OECD data banks, have been merged with information about the member state's political and institutional environment.

The second database, which was used in Chapters 3 and 4, is about the U.S. mobile telecommunications industry during the second half of the 1980's. The basis is constituted by a unique data set on market's characteristics that has been kindly made available by Phil Parker and Lars-Hendrik Röller. For the second essay, I enriched it with information stemming form the *Book of the States* and the *U.S. Statistical Abstract* about the state's regulatory policy and the political and regulatory environments. For the third essay, Astrid Jung and I rearranged the data used for the previous work and added additional political variables as well as information about firms' lobbying expenditures as expressed by their campaign contributions.

I believe that the two data sets constitute an excellent basis for analyses of the political economy of regulation since both contain market information

that are necessary for studying the firms' market interactions and the policy incidence, and political, regulatory, and institutional variables, which allow a careful study of the policy making process. Both databases, whose development I consider one of the contributions of this thesis, will surely be valuable for further research. Especially the database on OECD deregulation can still be widely exploited, since the study presented in the second chapter constitutes only a preliminary analysis of the political side of the data, which was useful for fully understanding the importance of political considerations, but that can be enriched to encompass the relationship between market and politics.[1]

I consider this thesis as a first step towards an empirical approach to the political economy of industrial and competition policy. In fact, the methodology that I used in this work is not limited to the analysis of regulation but rather it can be applied to the analysis of other forms of economic policy such as merger control, the allocation of infrastructure investments, the allocation of state aid.[2] The main point I made in this work is that, in order to correctly analyze policy incidence (both from the empirical and theoretical point of views), it is necessary to recognize the endogenous nature of the policy decisions, which must be explicitly modeled. Moreover, I point out the need for considering that firms operate in many different dimensions that influence each other. Particularly, the link between firms' product market conduct and their lobbying behavior play a central role when analyzing regulated markets.

[1] Duso and Röller (2001) propose a first analysis of the interactions between product and political markets using the database on OECD deregulation and making more extensive use of the market side of the data.

[2] See for instance Duso, Neven and Röller (2002) for an empirical analysis of the political economy of merger control procedures that uses European data.

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